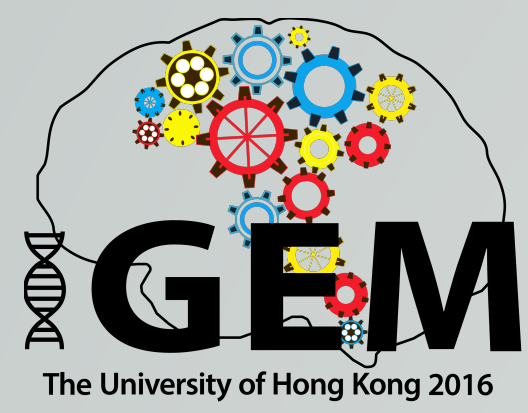
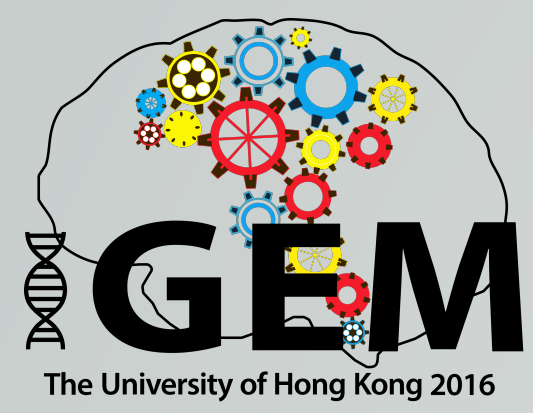




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in-vivo synthesis of DNA nanostructures for disease diagnosis through miRNA- induced structural transformation

in-vivo synthesis of DNA nanostructures for disease diagnosis through miRNA- induced structural transformation



Design Criteria

Design Criteria

Biocompatible

Easily modifiable

Can be synthesised by bacteria

miRNA



miRNA

Important in a micro way.



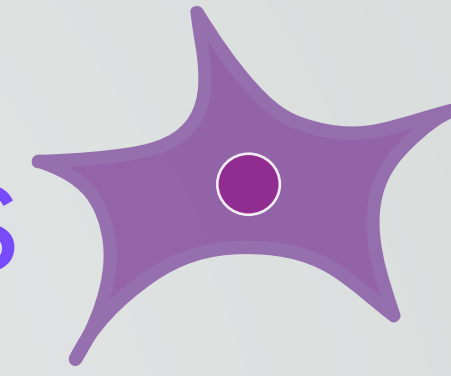
miRNA

Important in a micro way.

Important biomarkers



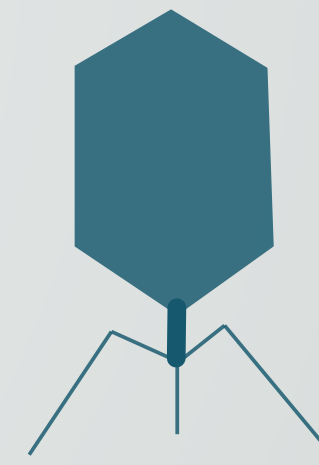
Neurological pathologies



Cardiovascular diseases



Viral infections



Many types of cancers

miRNA

Important biomarkers

miRNA

Important biomarkers

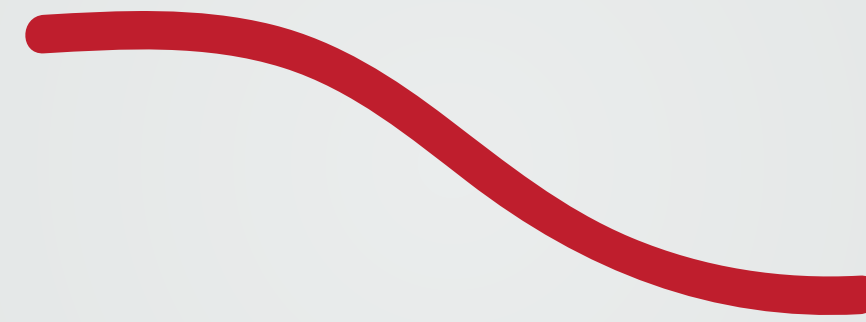
miRNA

Important biomarkers



miRNA

Important biomarkers



~ 22nt long

miRNA

Important biomarkers



miRNA

Important biomarkers

miRNA

Important biomarkers

miRNA

Important biomarkers

hsa-miR-34b-3p

5' - UAGGCAGUGUCAUUAGCUGAUUG -3'

Pre-manifest + ongoing Huntington's disease

miRNA



The tetrahedron

The tetrahedron

Seeing is believing.

The tetrahedron

Seeing is believing.

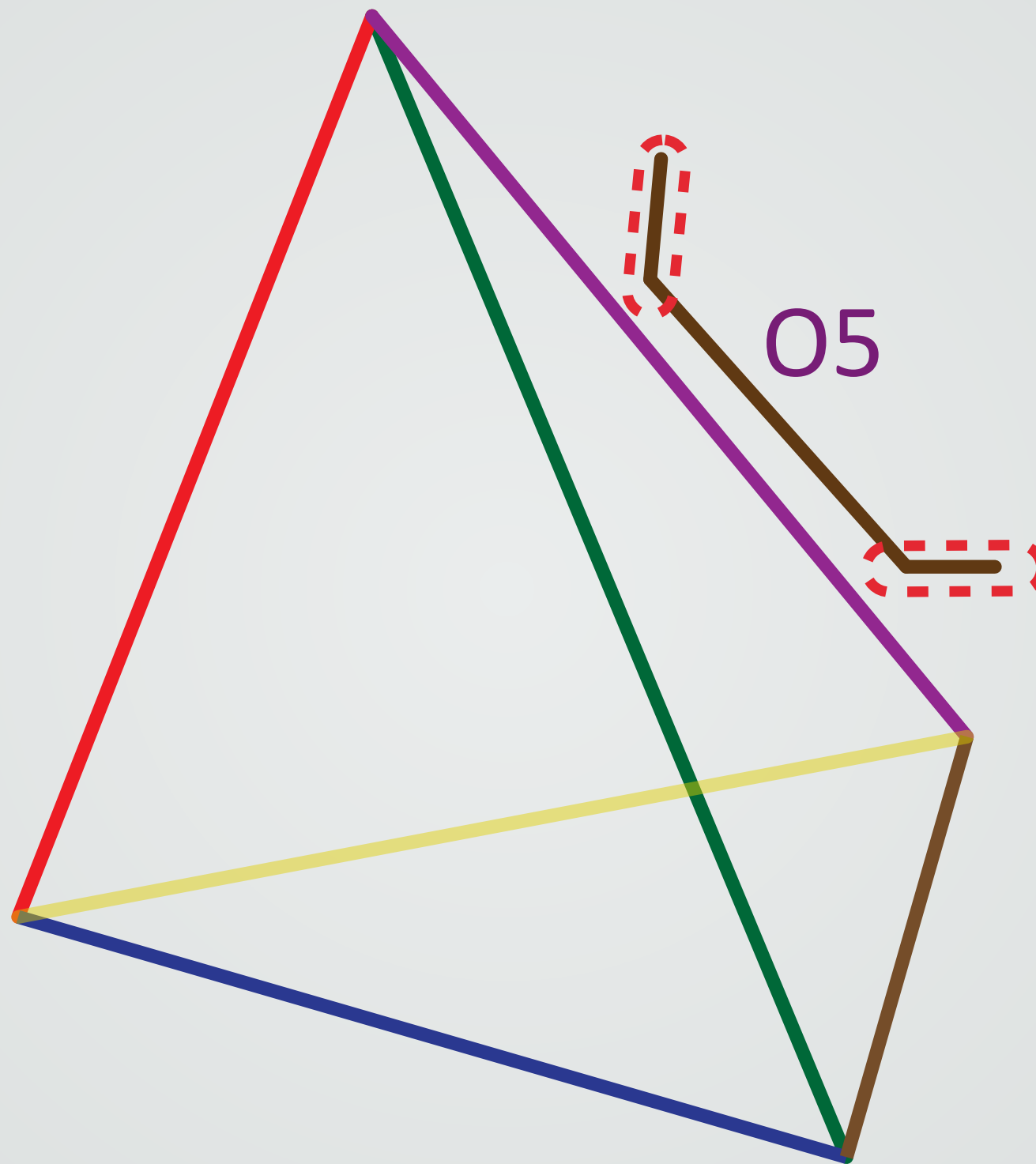


The tetrahedron

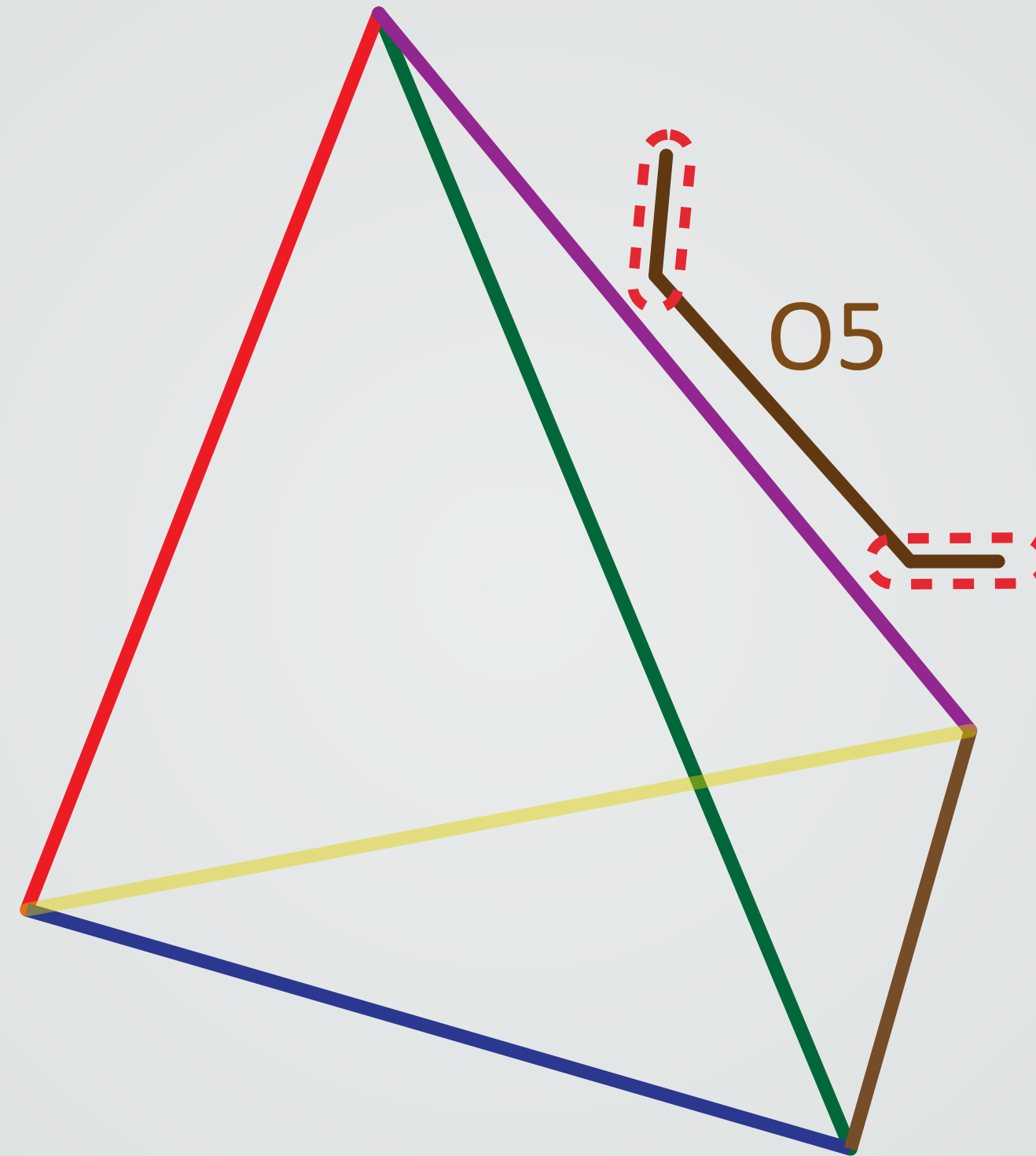
The tetrahedron



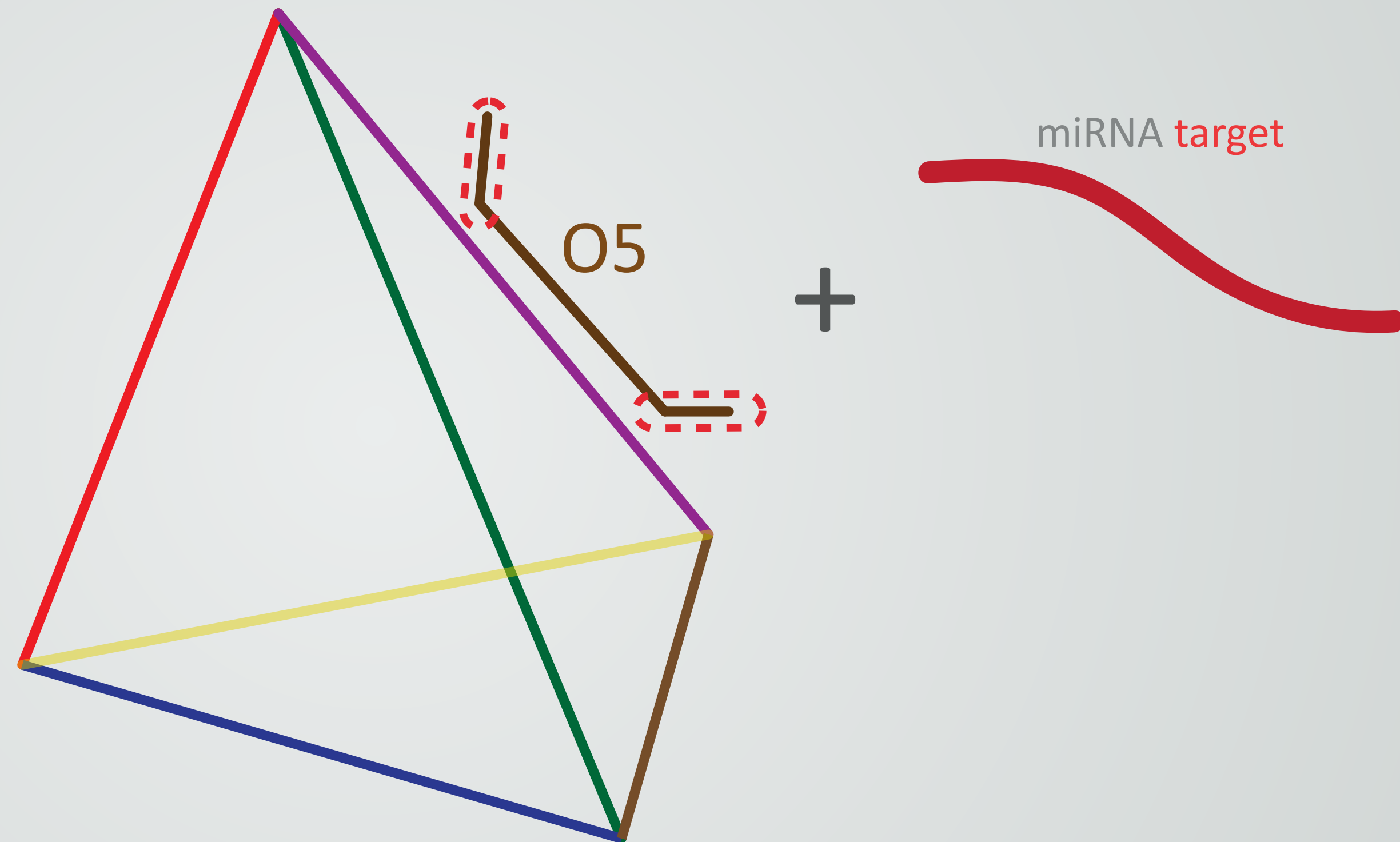
The tetrahedron



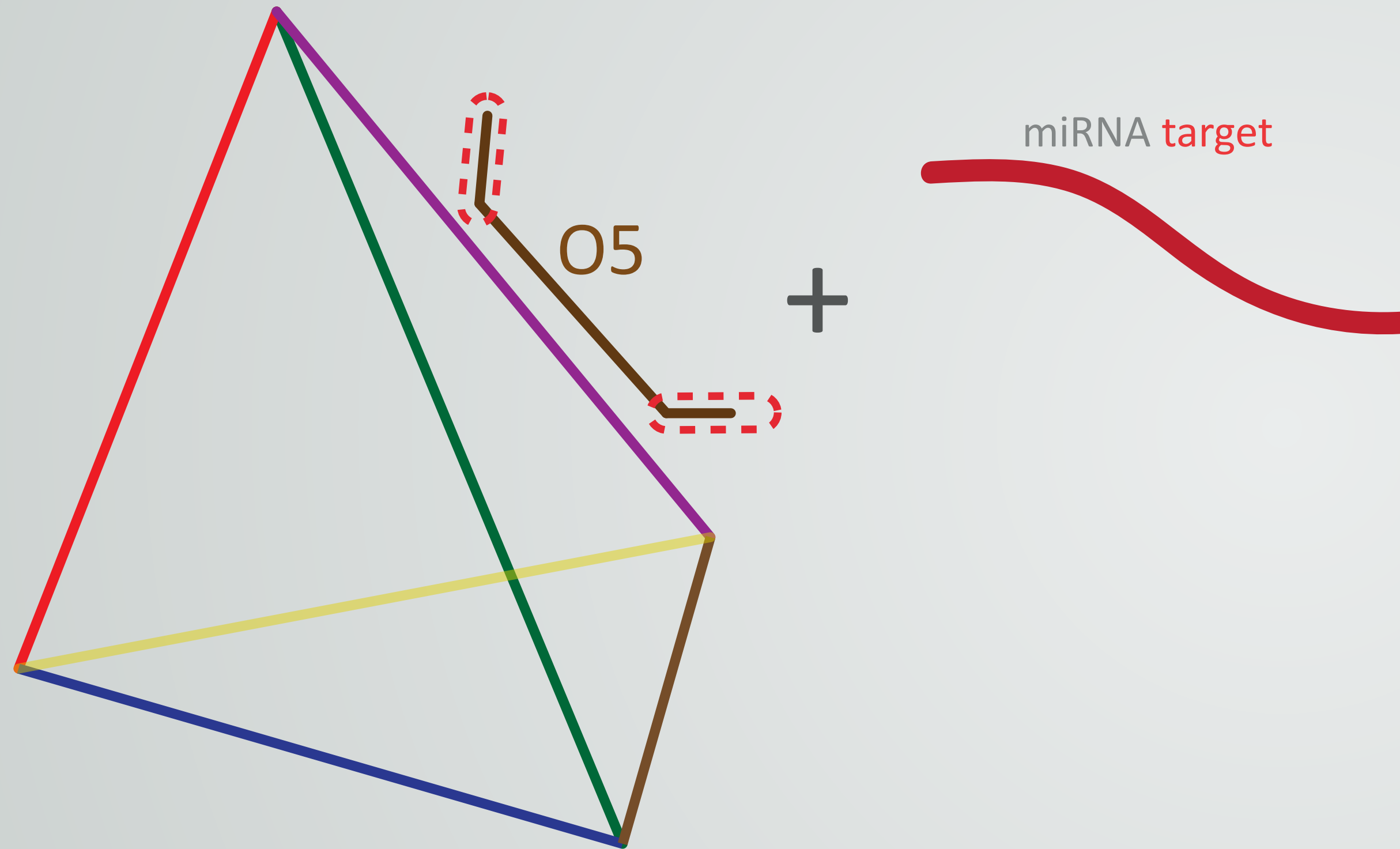
The tetrahedron



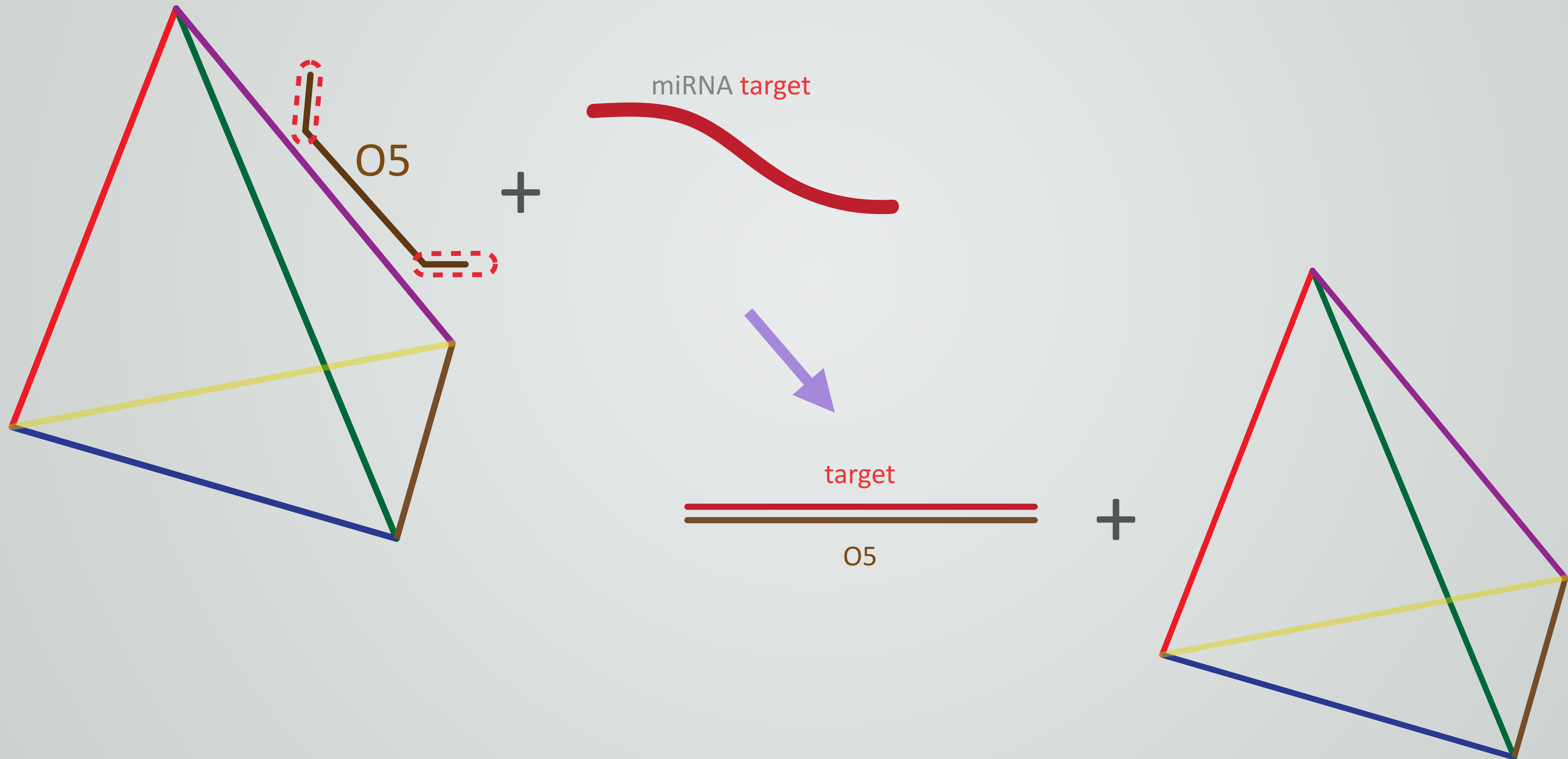
The tetrahedron



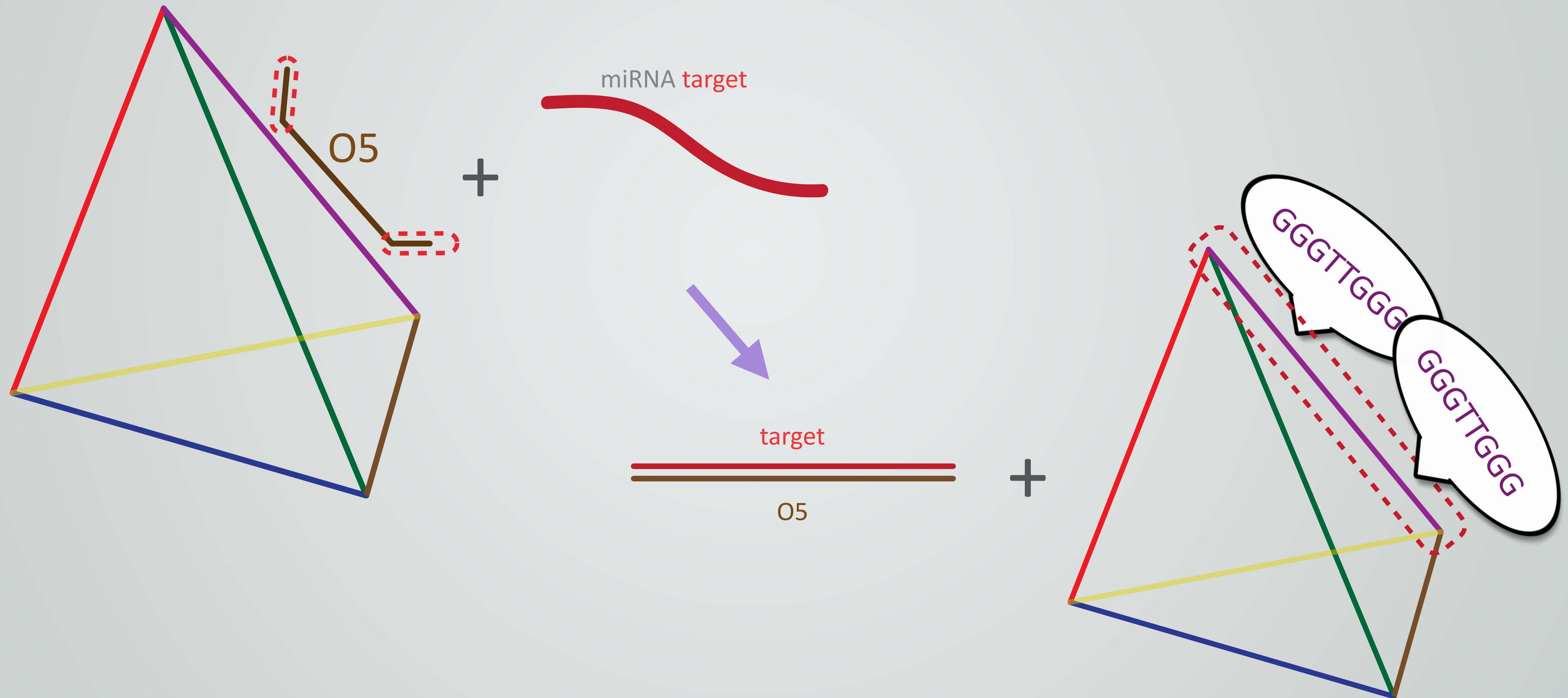
The tetrahedron



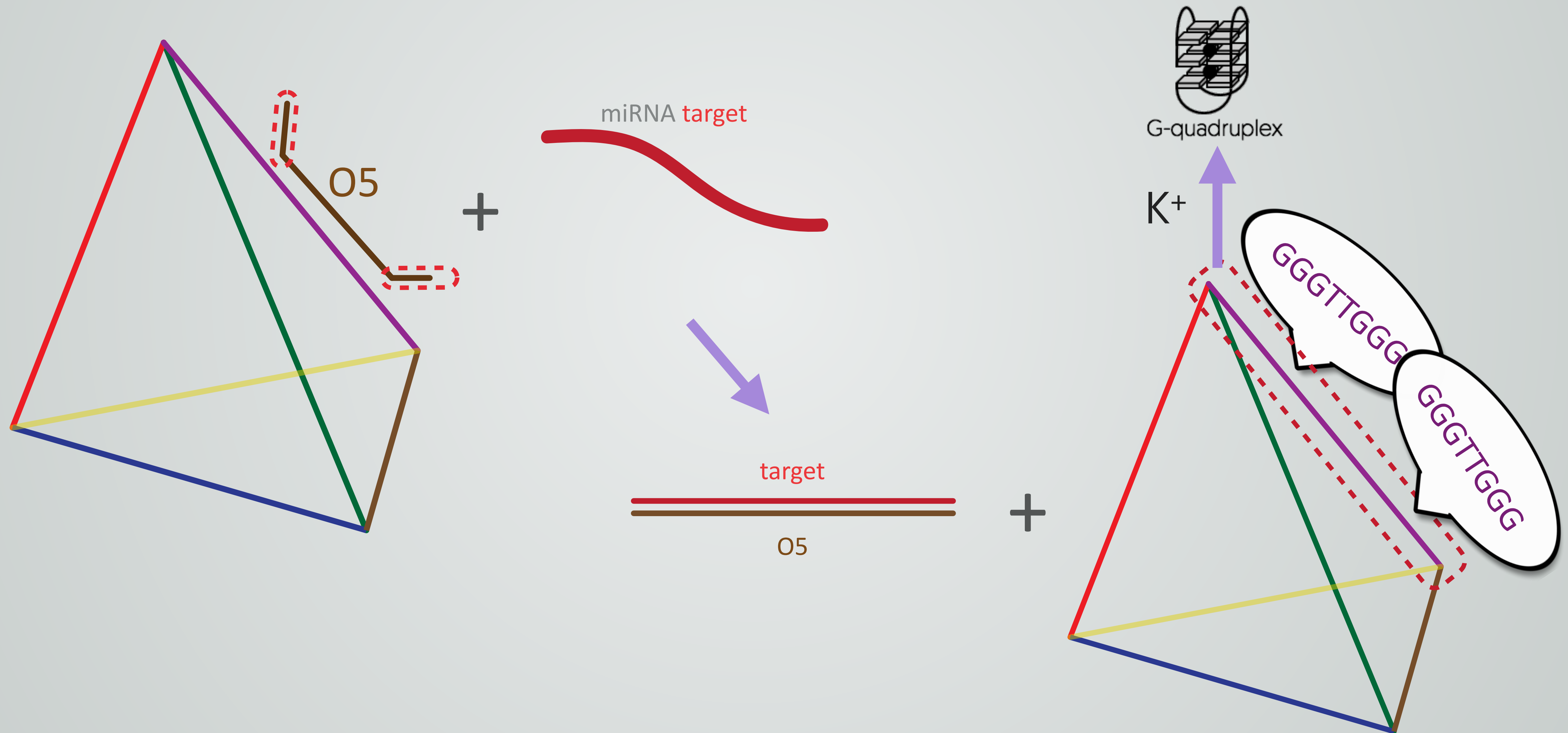
The tetrahedron



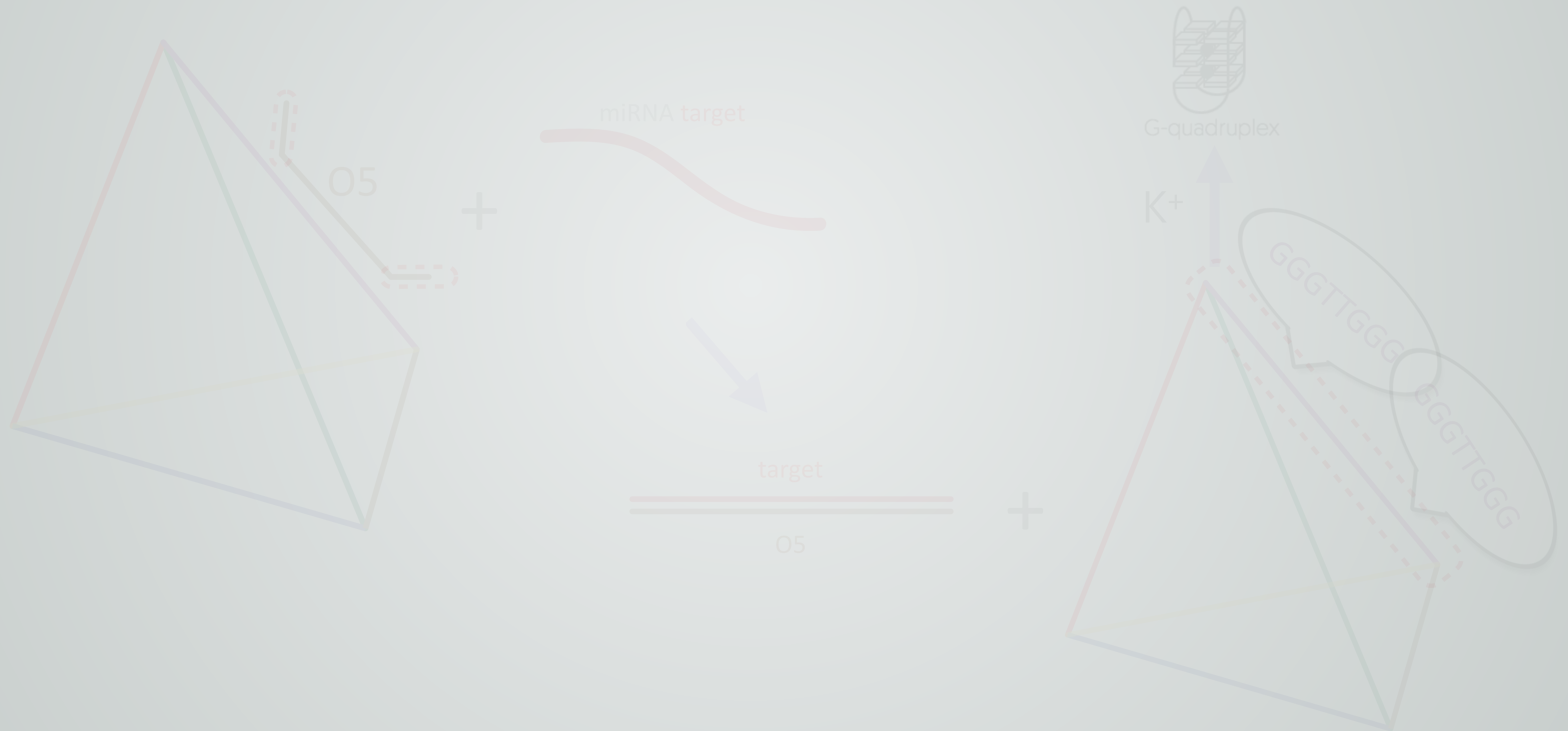
The tetrahedron



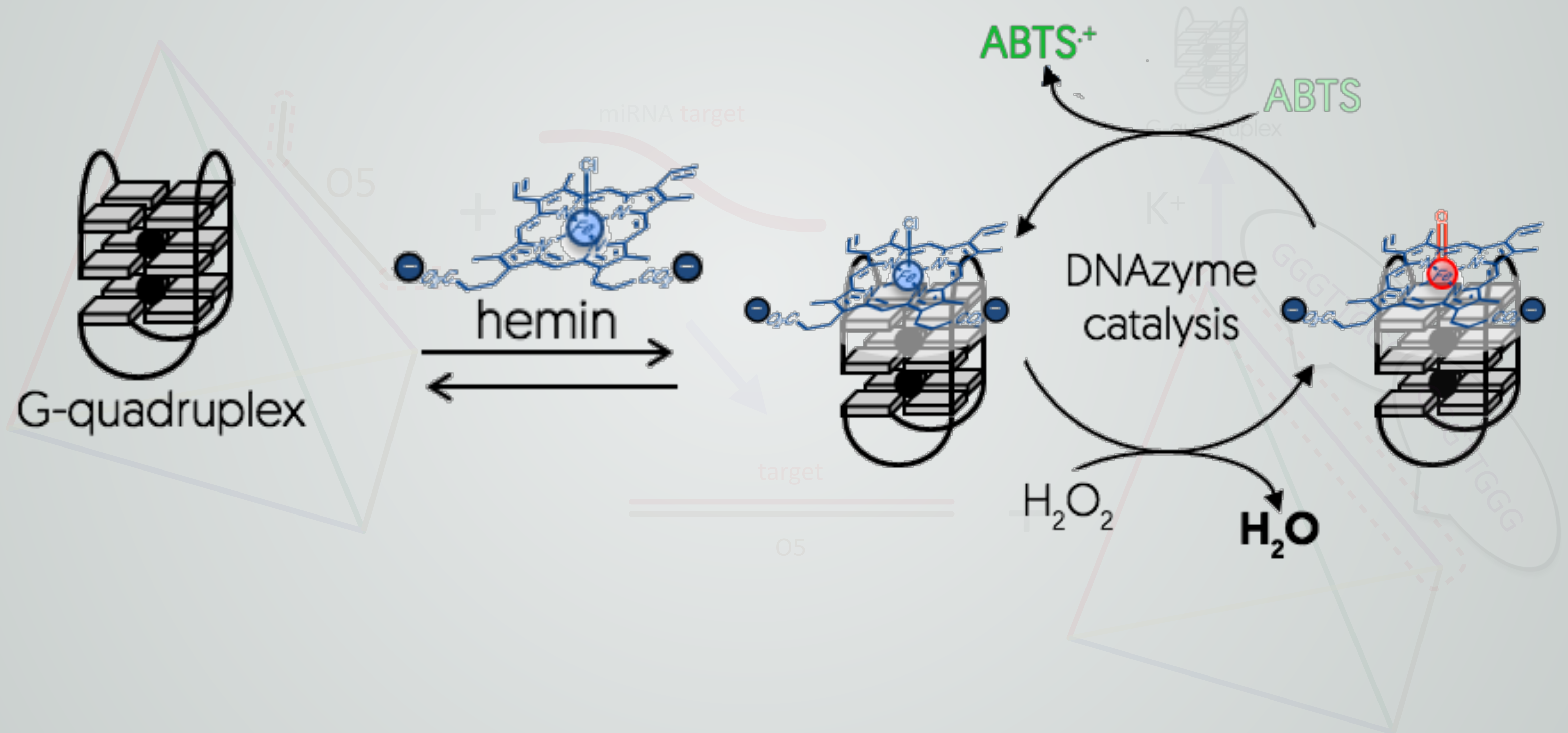
The tetrahedron



The tetrahedron



The tetrahedron





The tetrahedron

Our inspiration

The tetrahedron

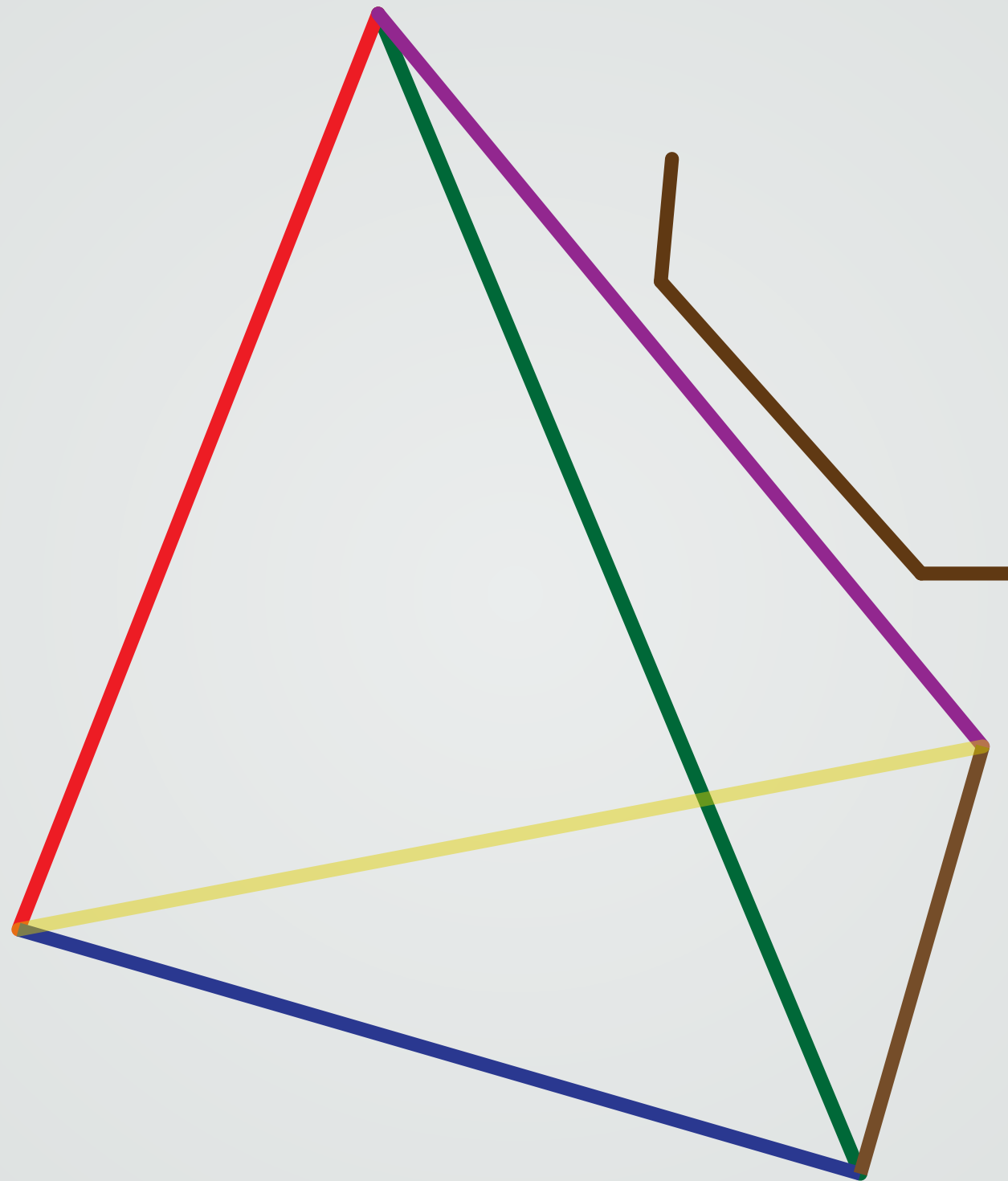


The tetrahedron

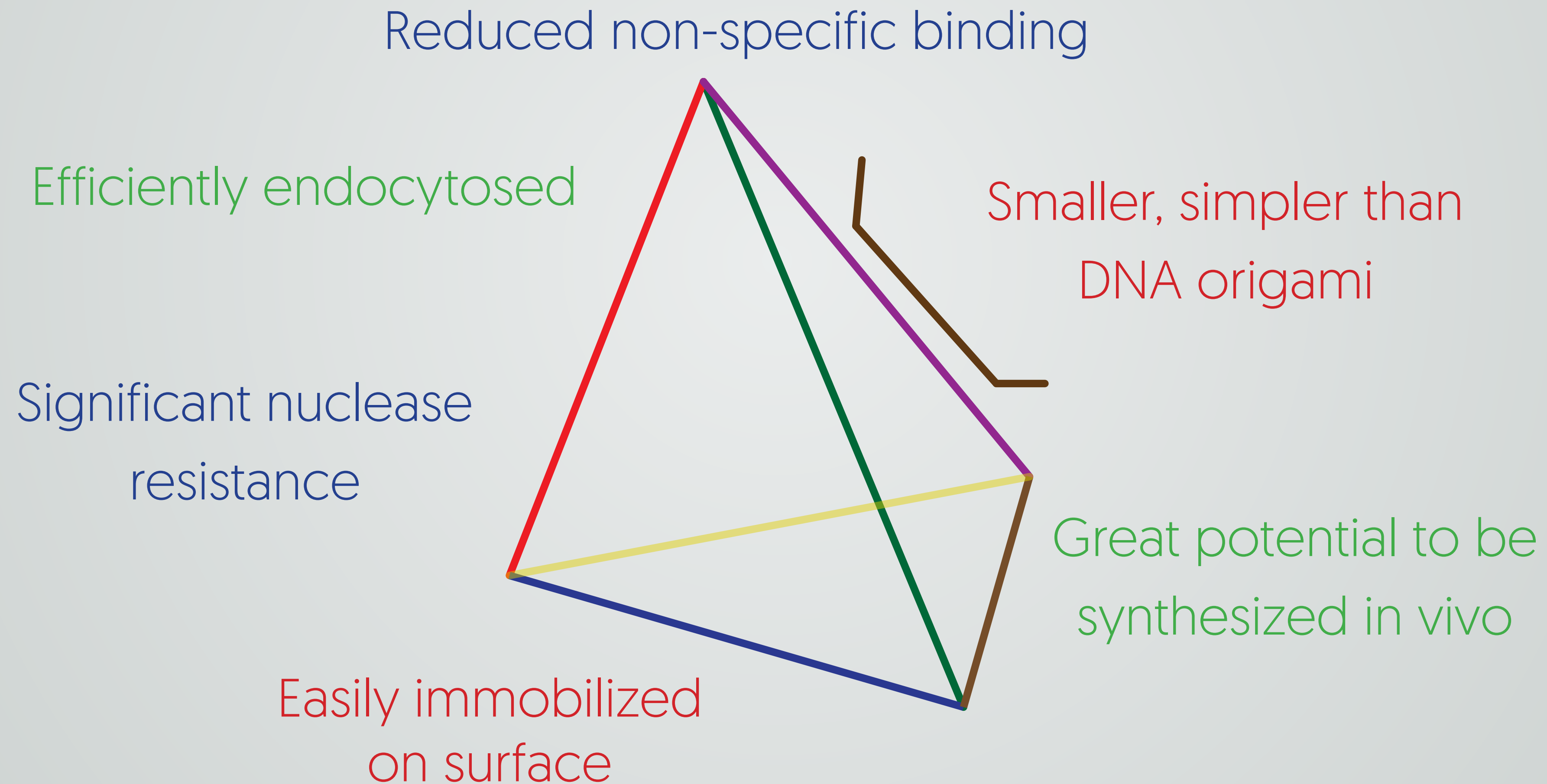


中國銀行
BANK OF CHINA

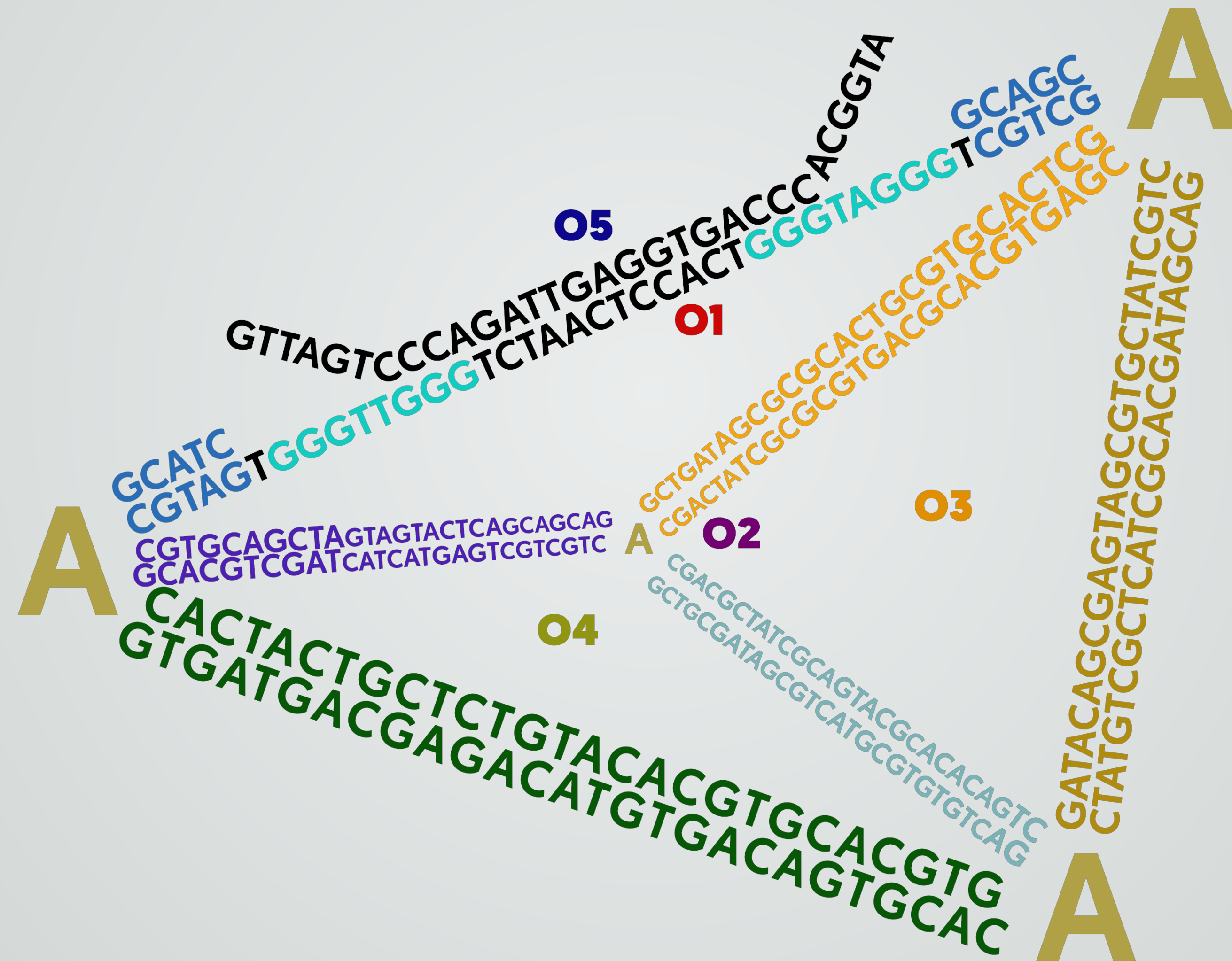
The tetrahedron



The tetrahedron

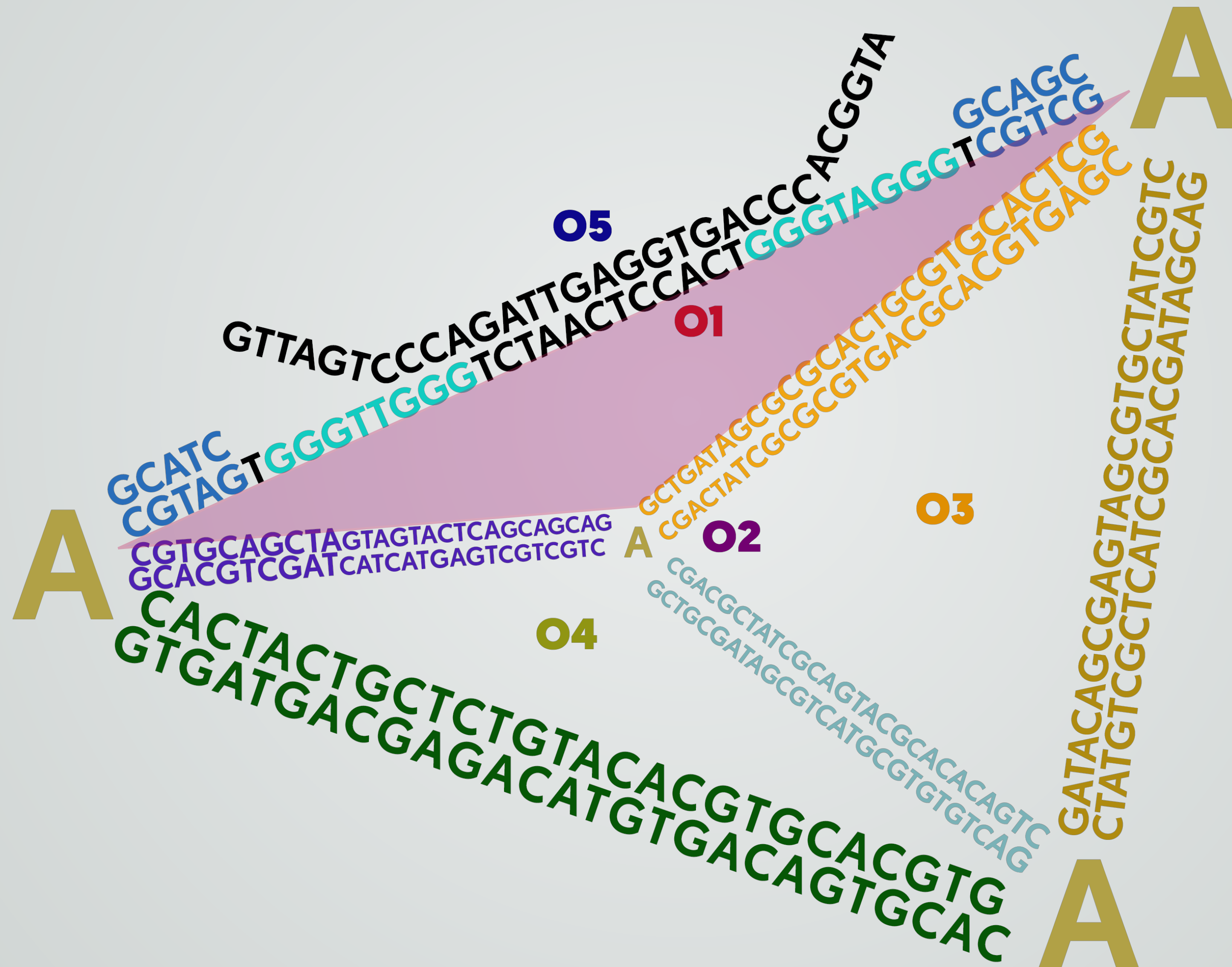


The tetrahedron

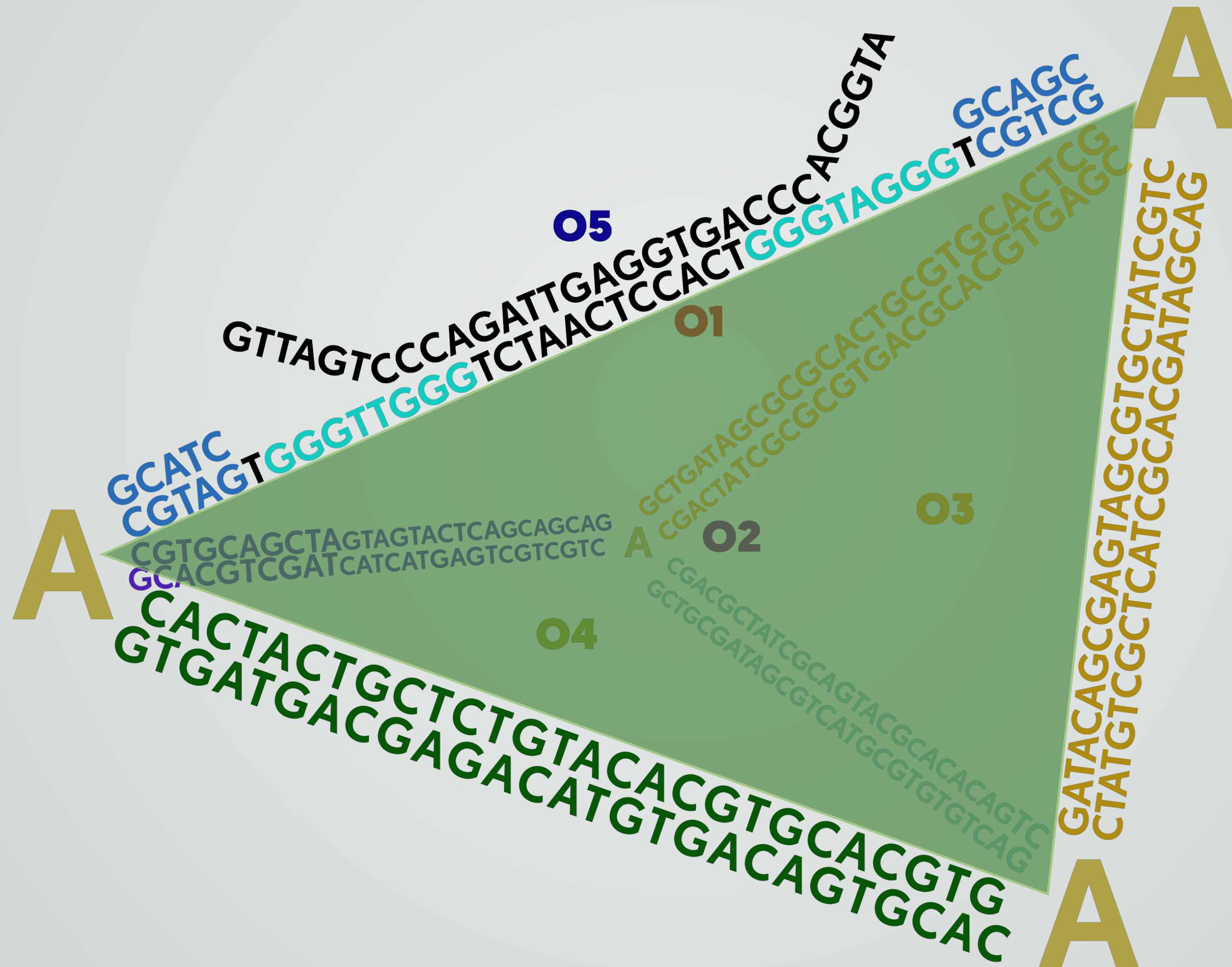


Results

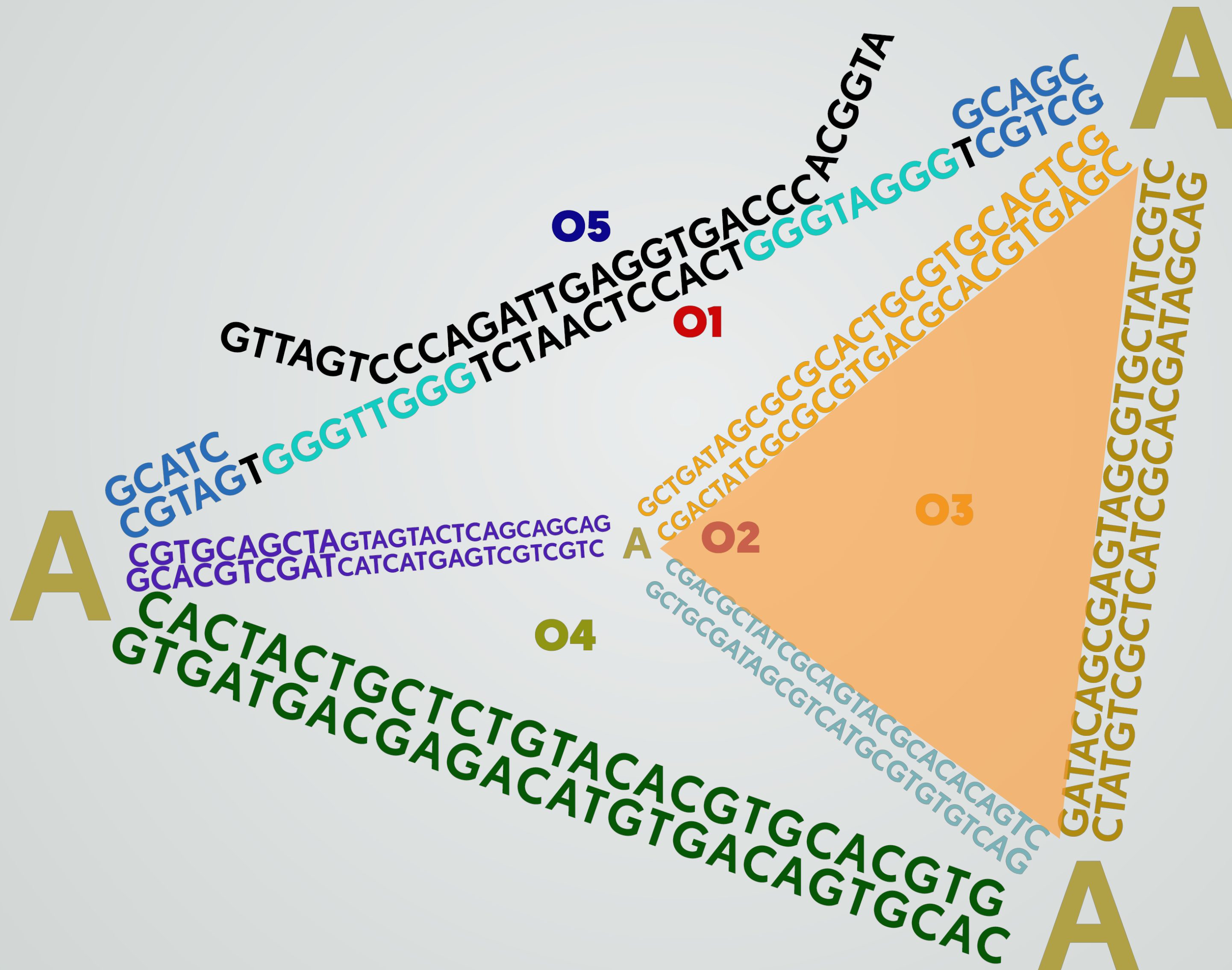
Results



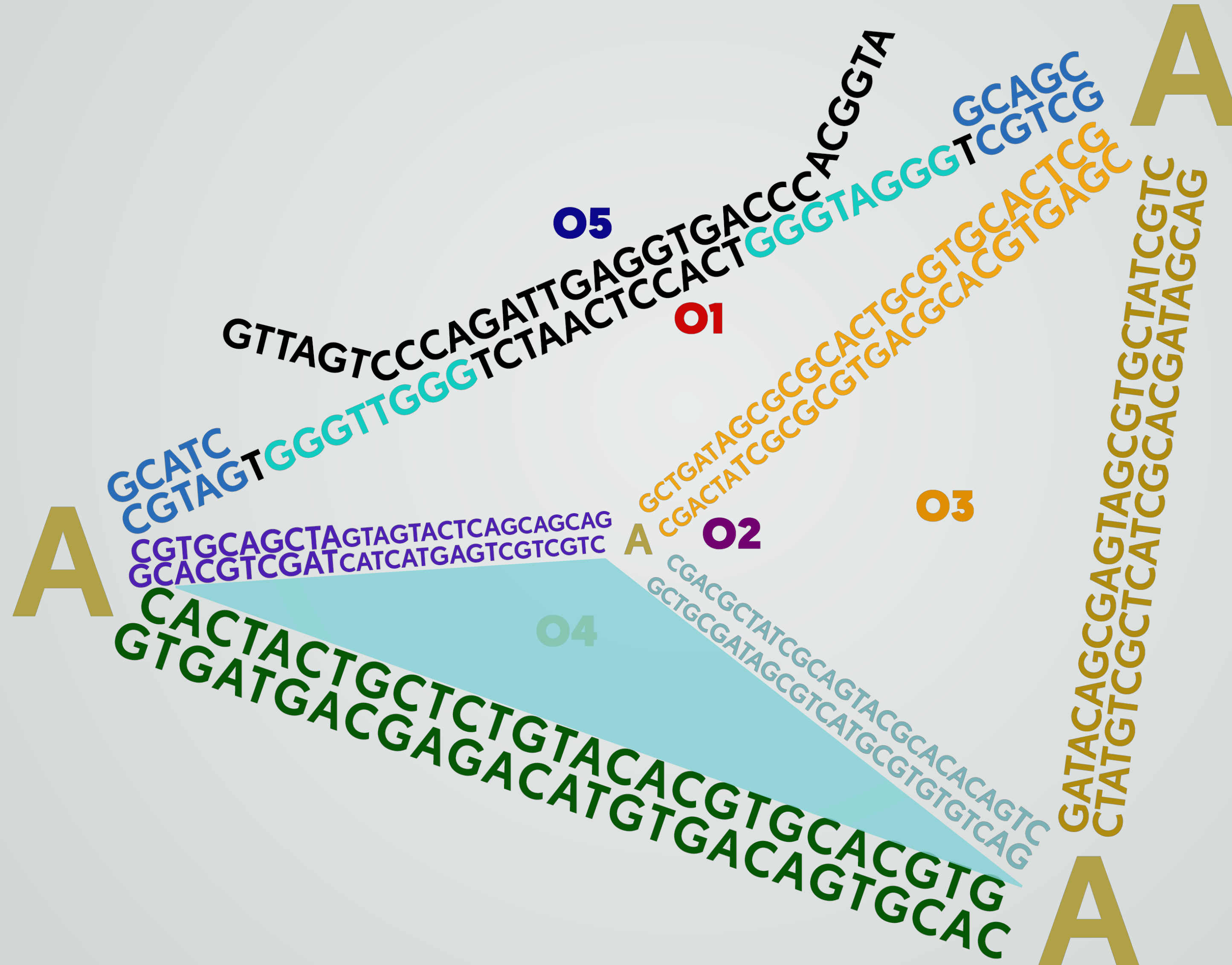
Results

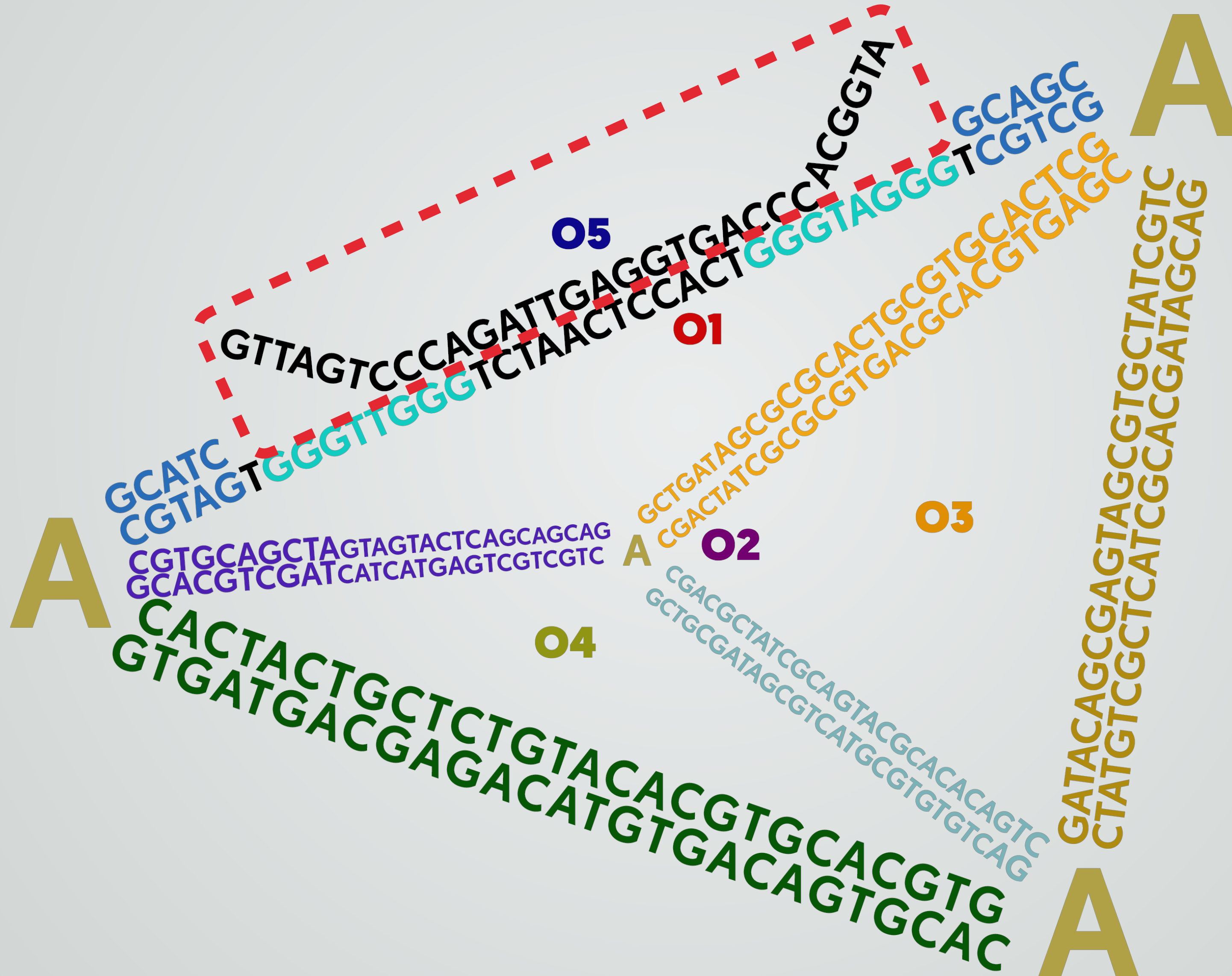


Results

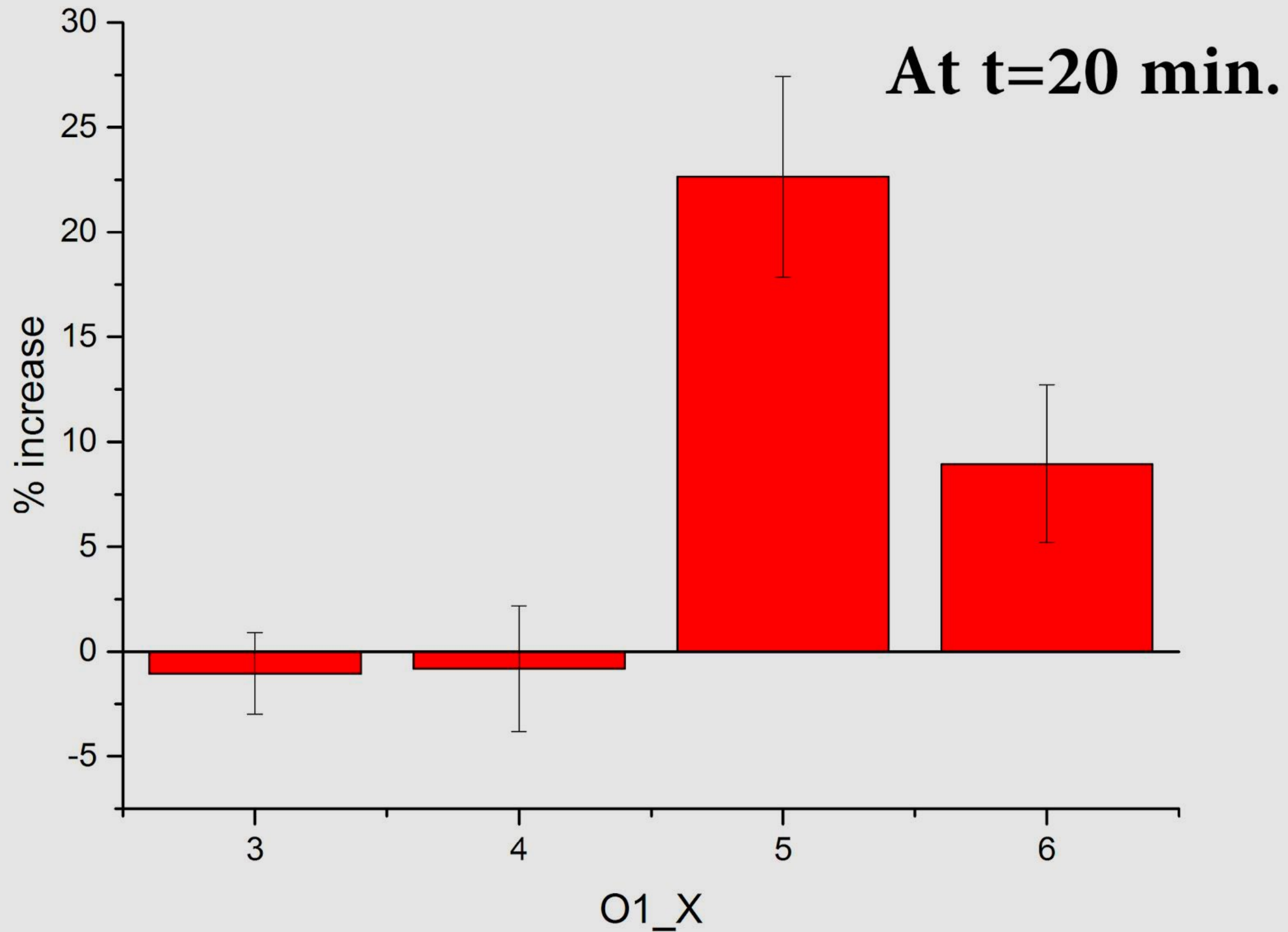


Results



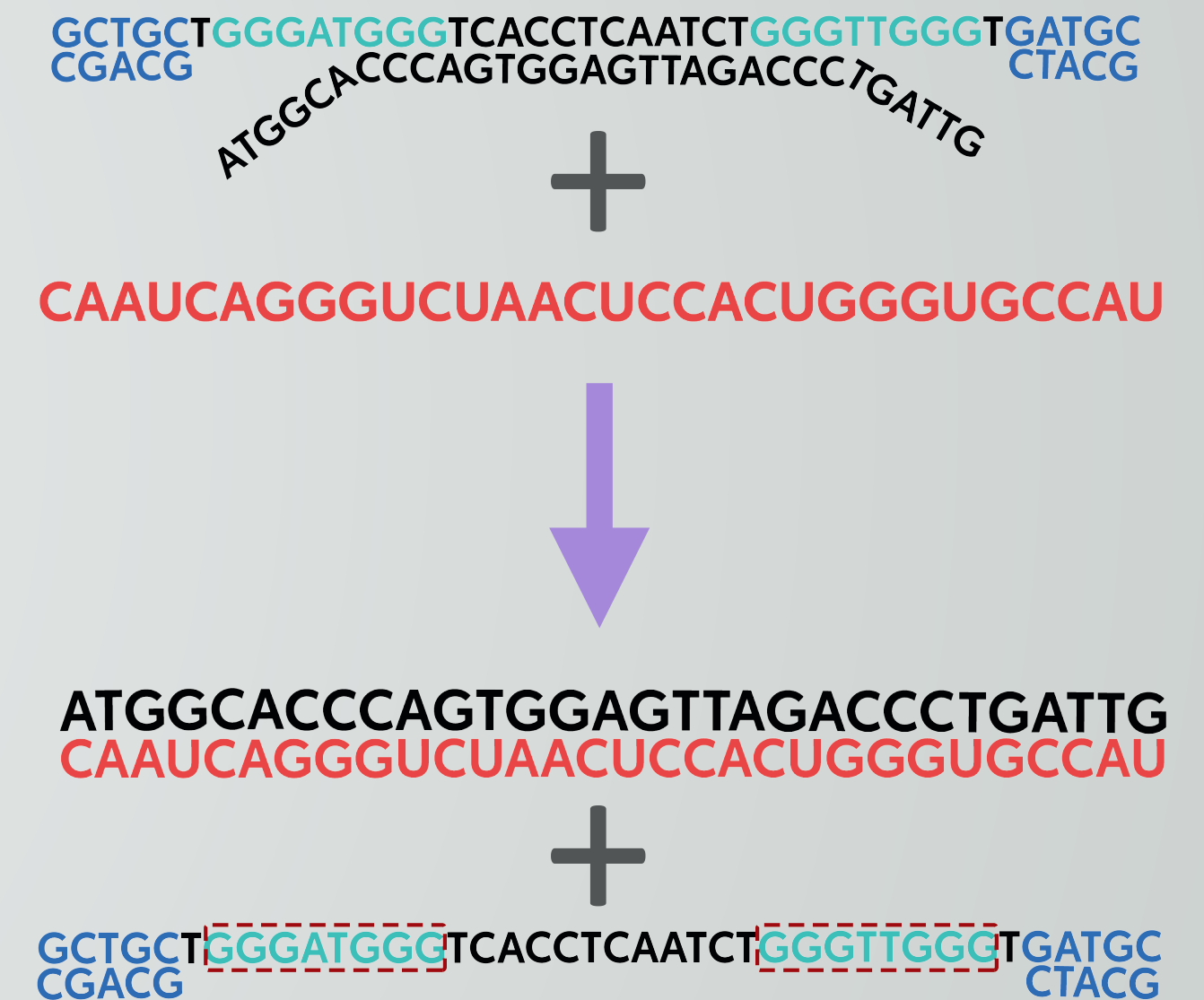
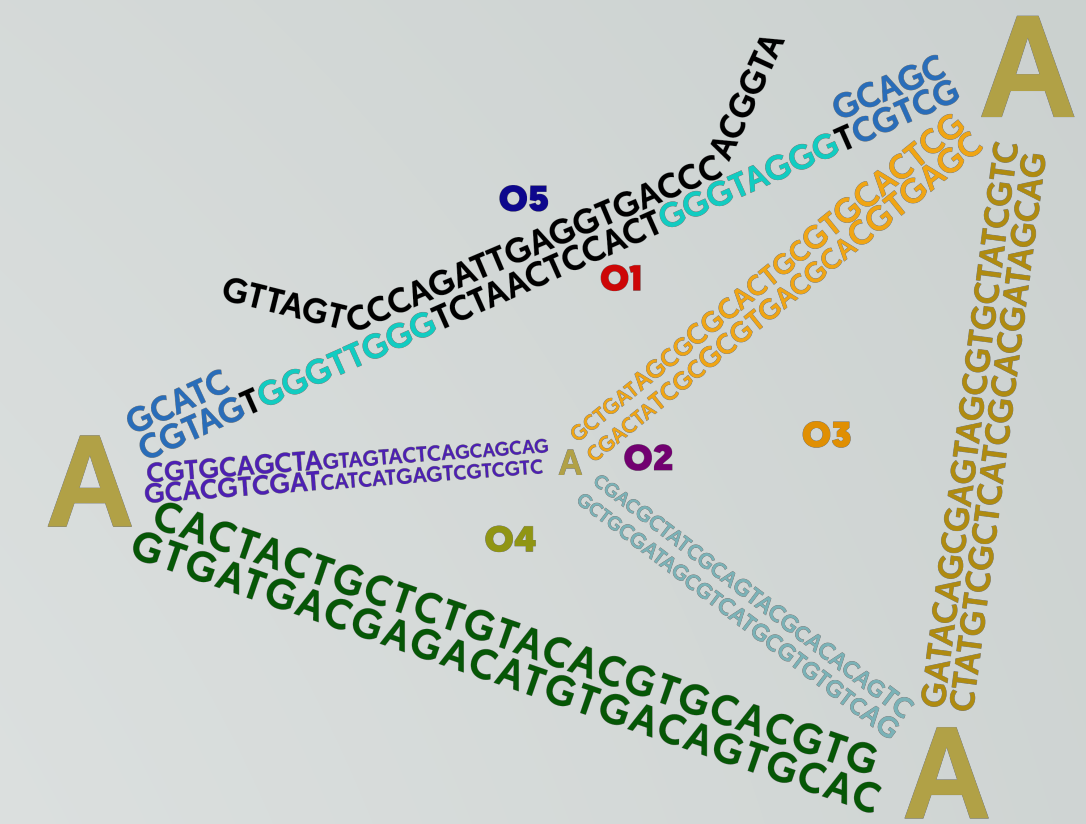
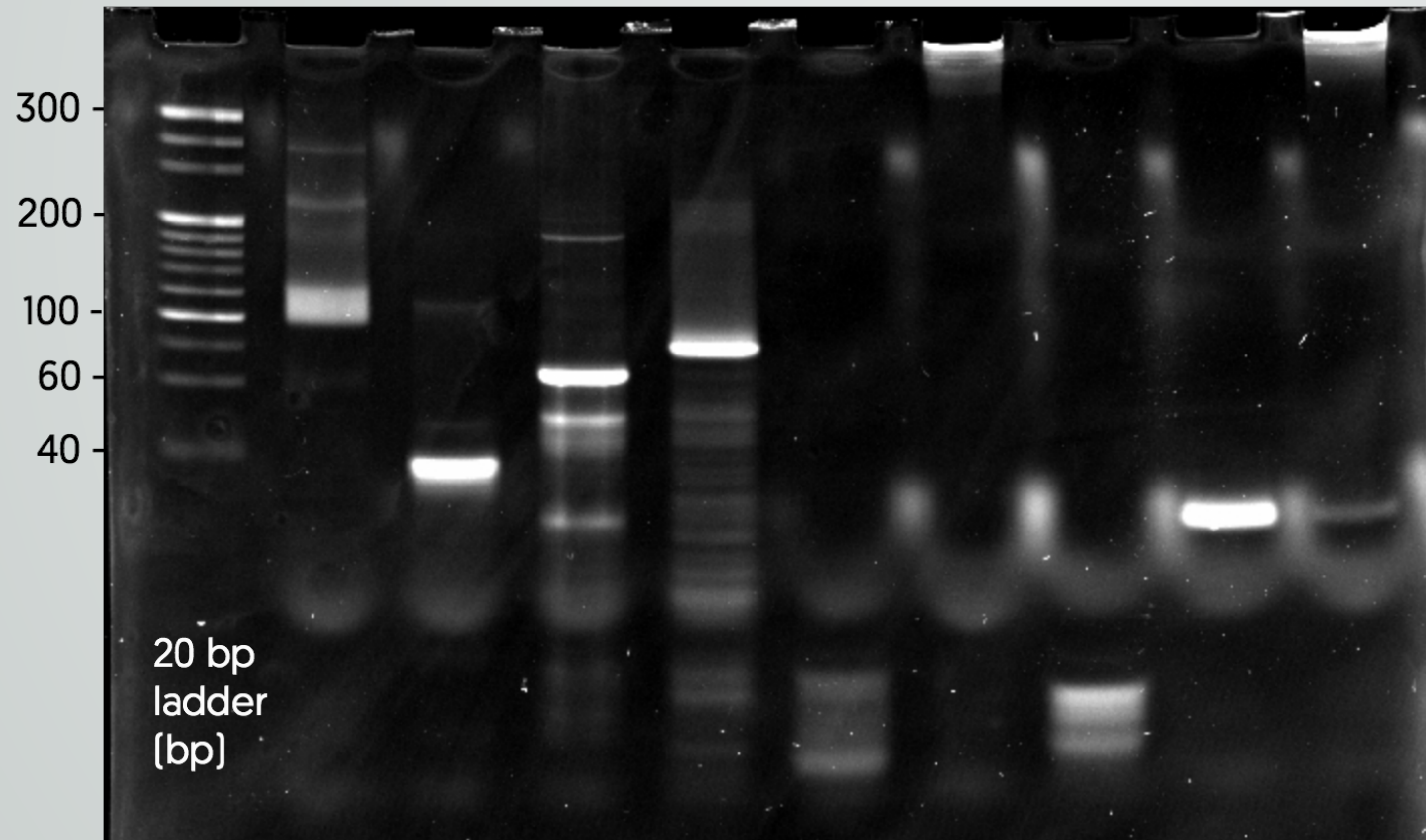


Results



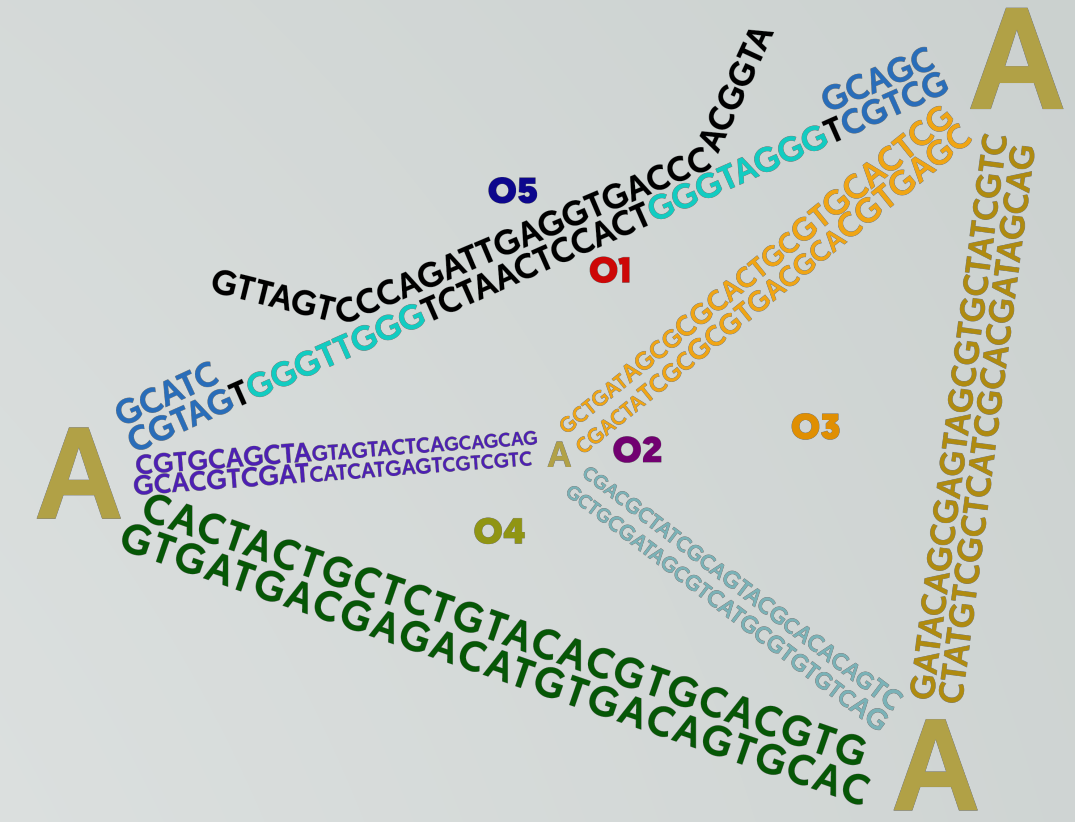
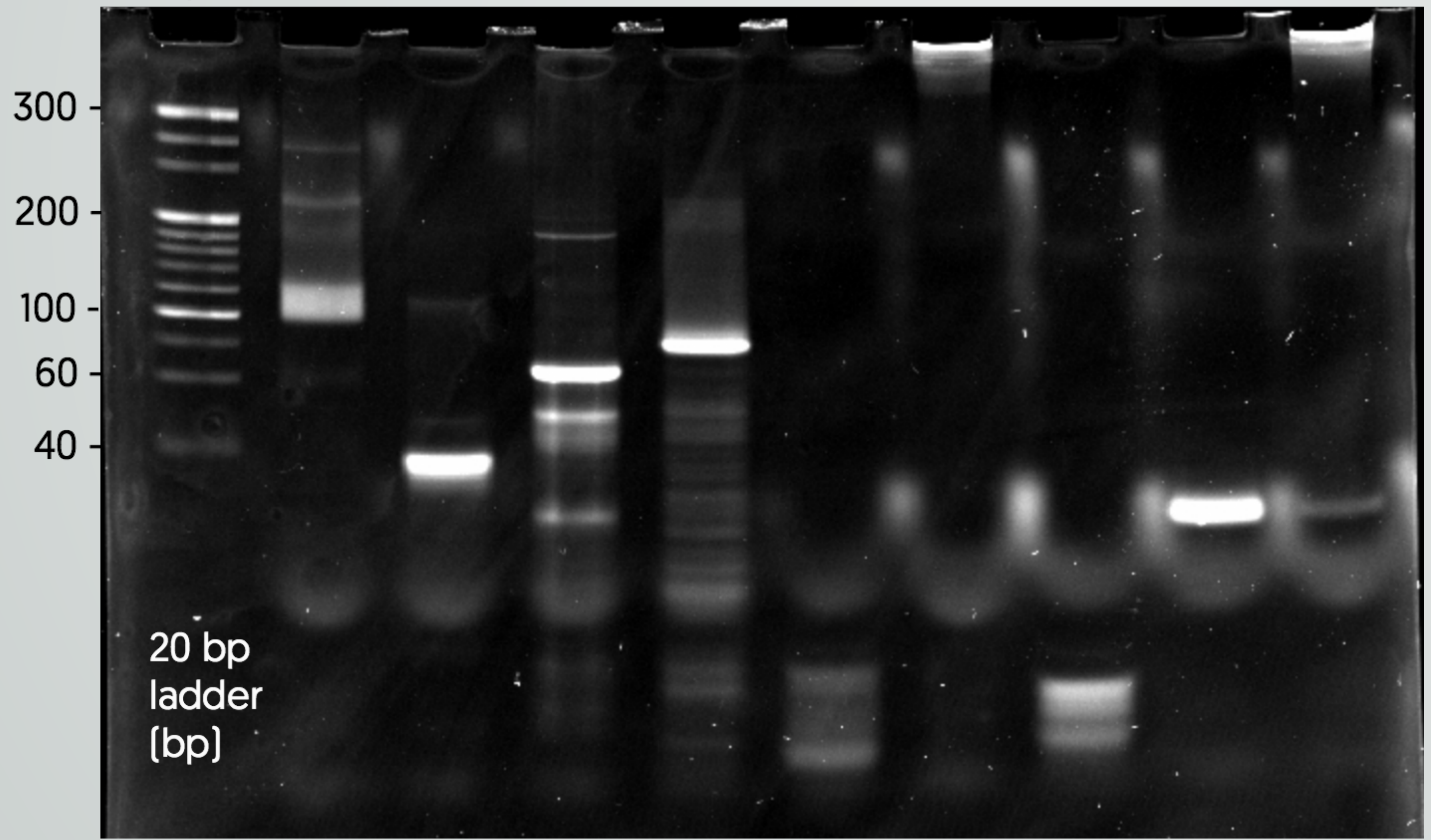
Results

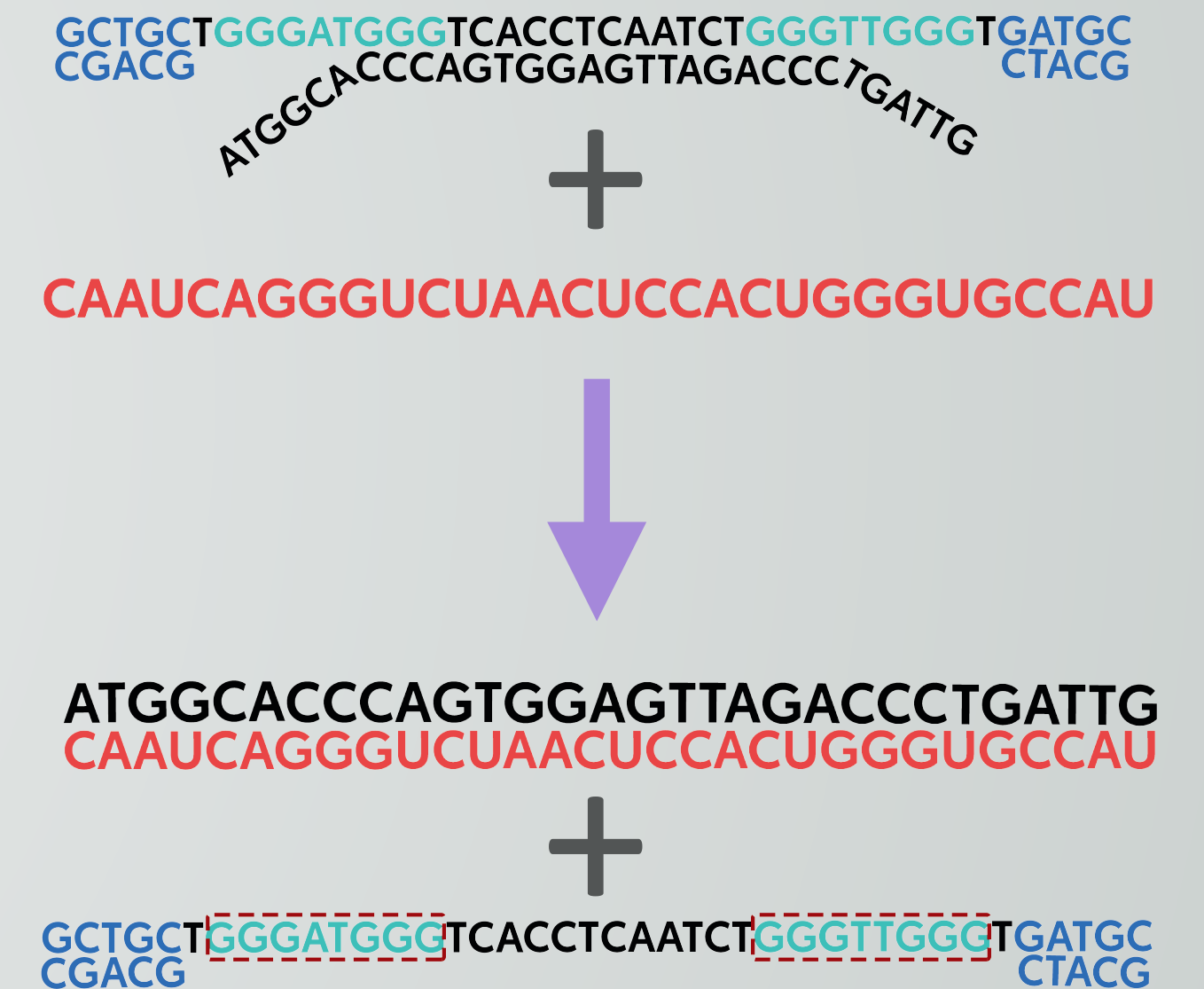
O1	+					+				+
O2		+				+				+
O3			+			+				+
O4				+		+				+
O5					+	+		+	+	+
input							+	+		+

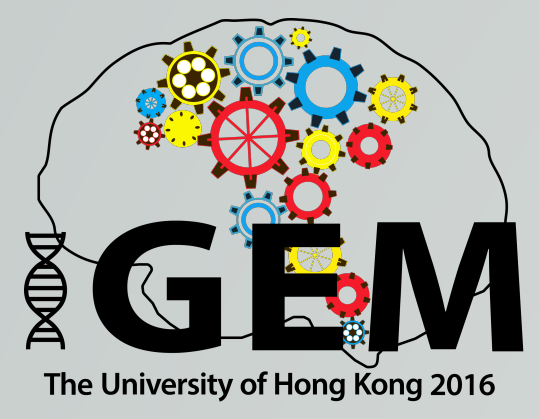


Results

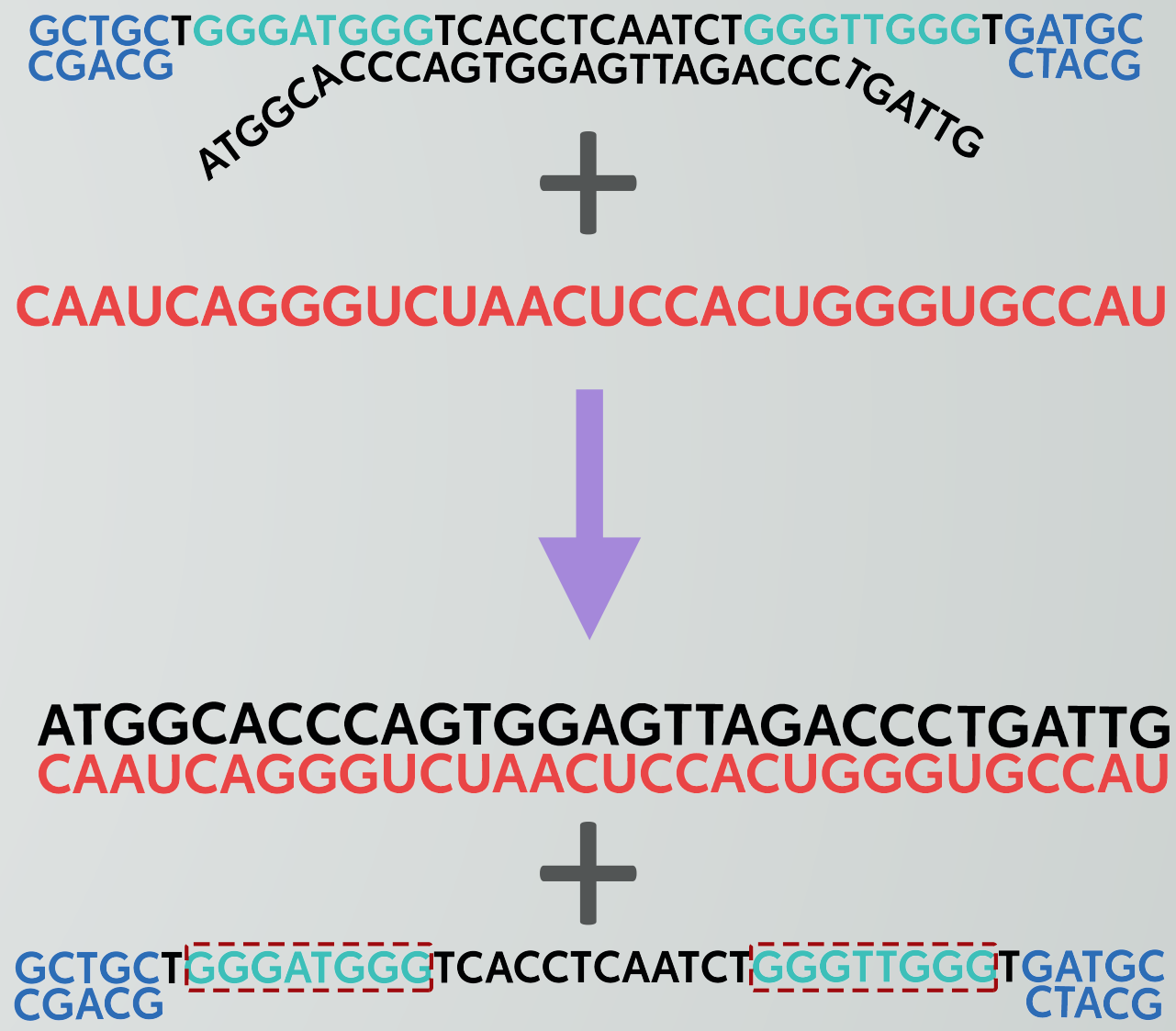
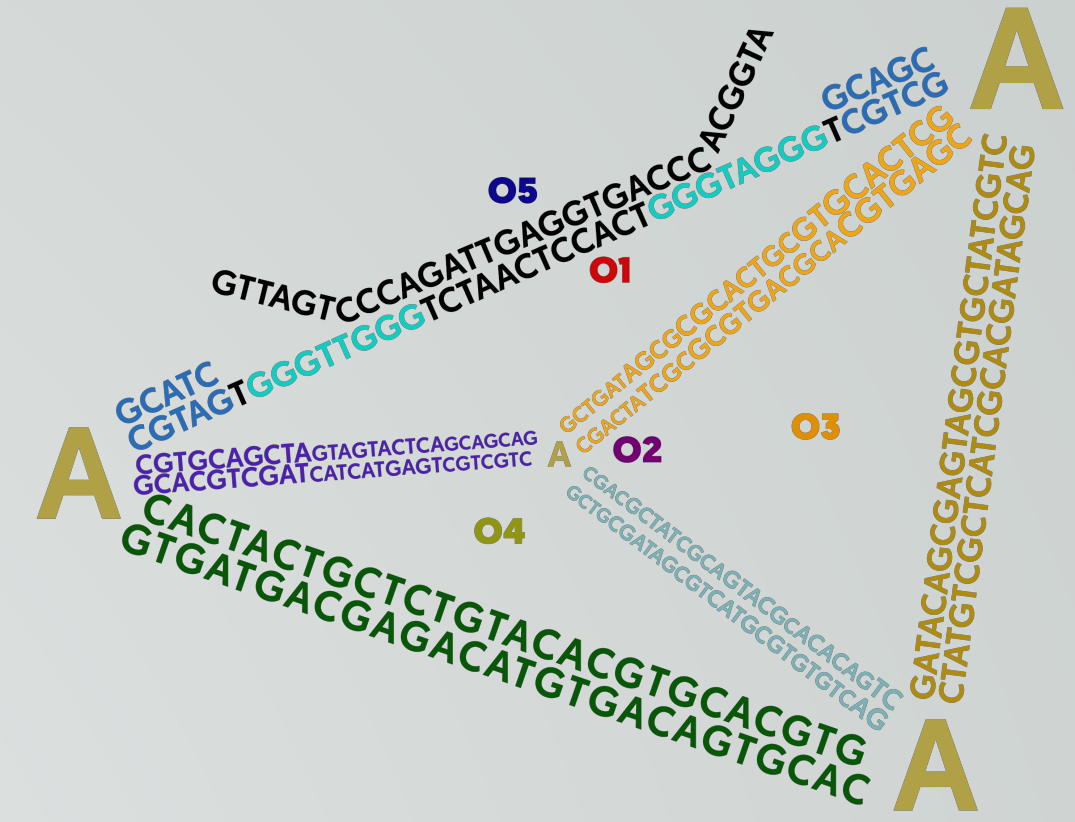
O1	+					+				+
O2		+				+				+
O3			+			+				+
O4				+		+				+
O5					+	+		+		+
input							+	+		+

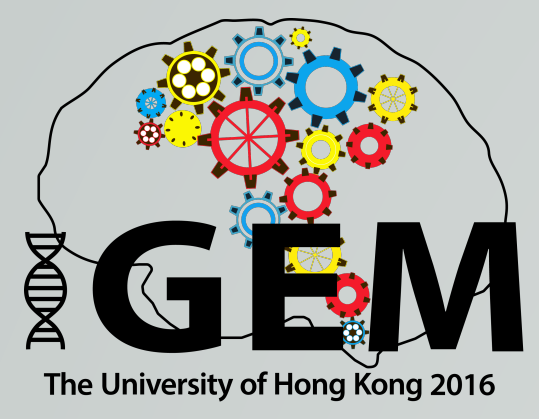




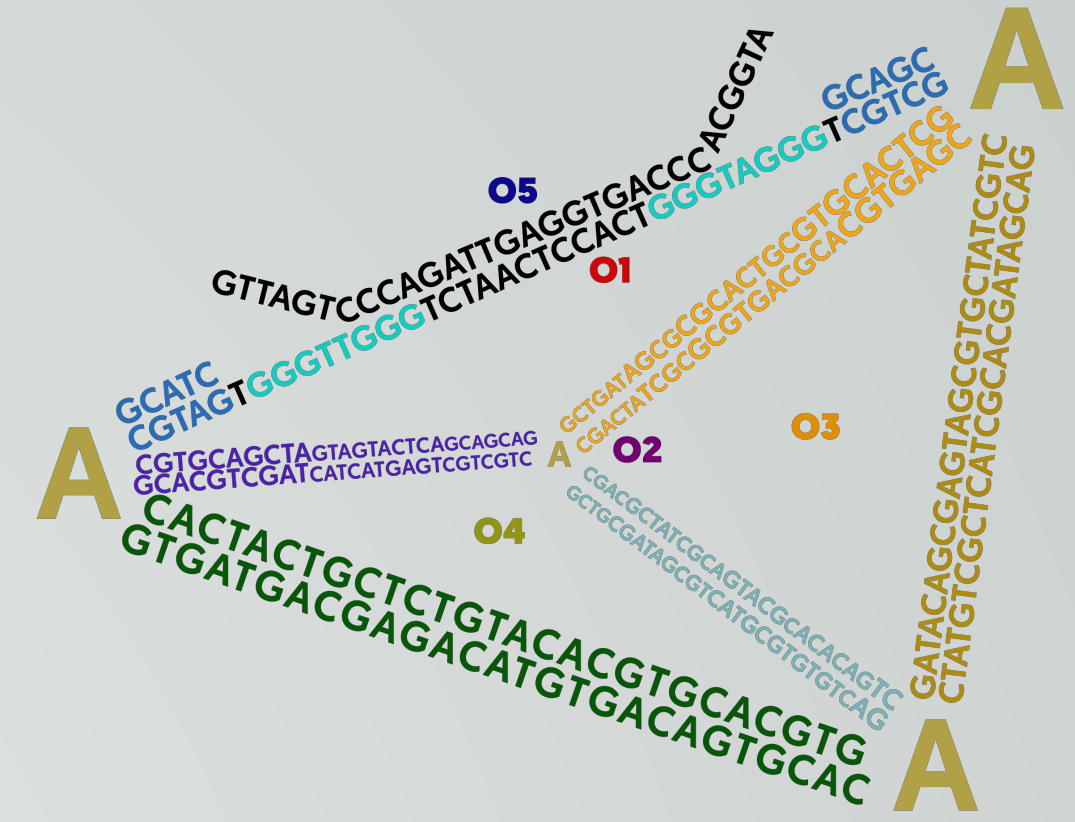


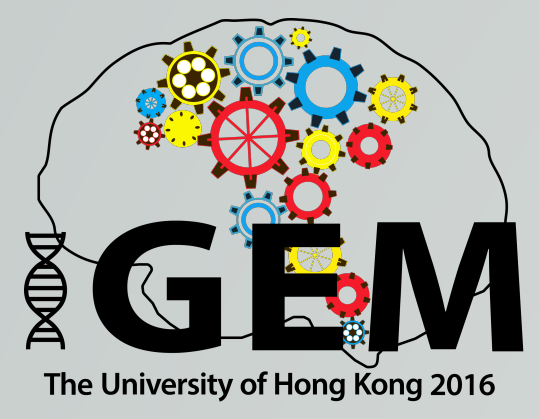
Results



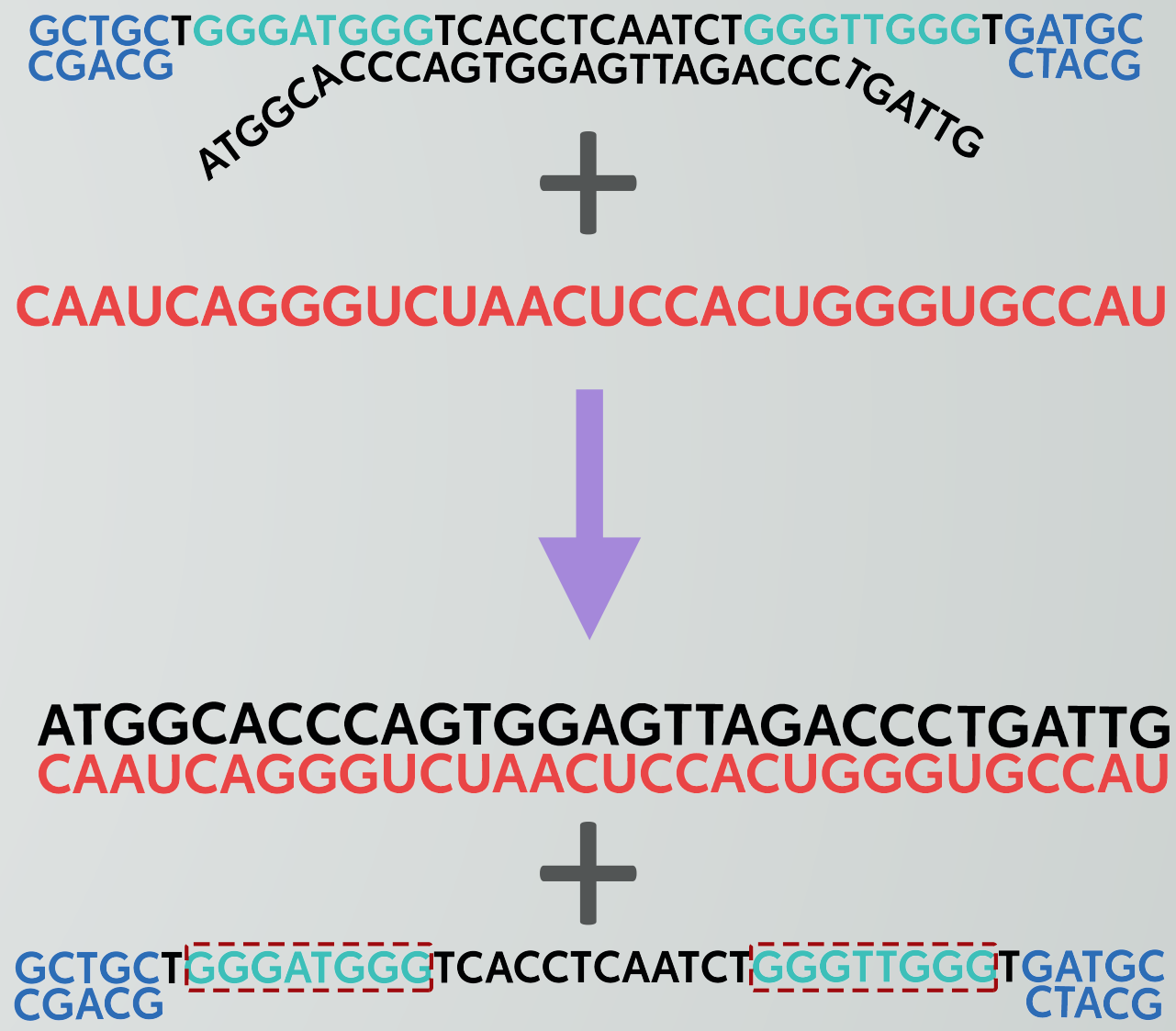


Results



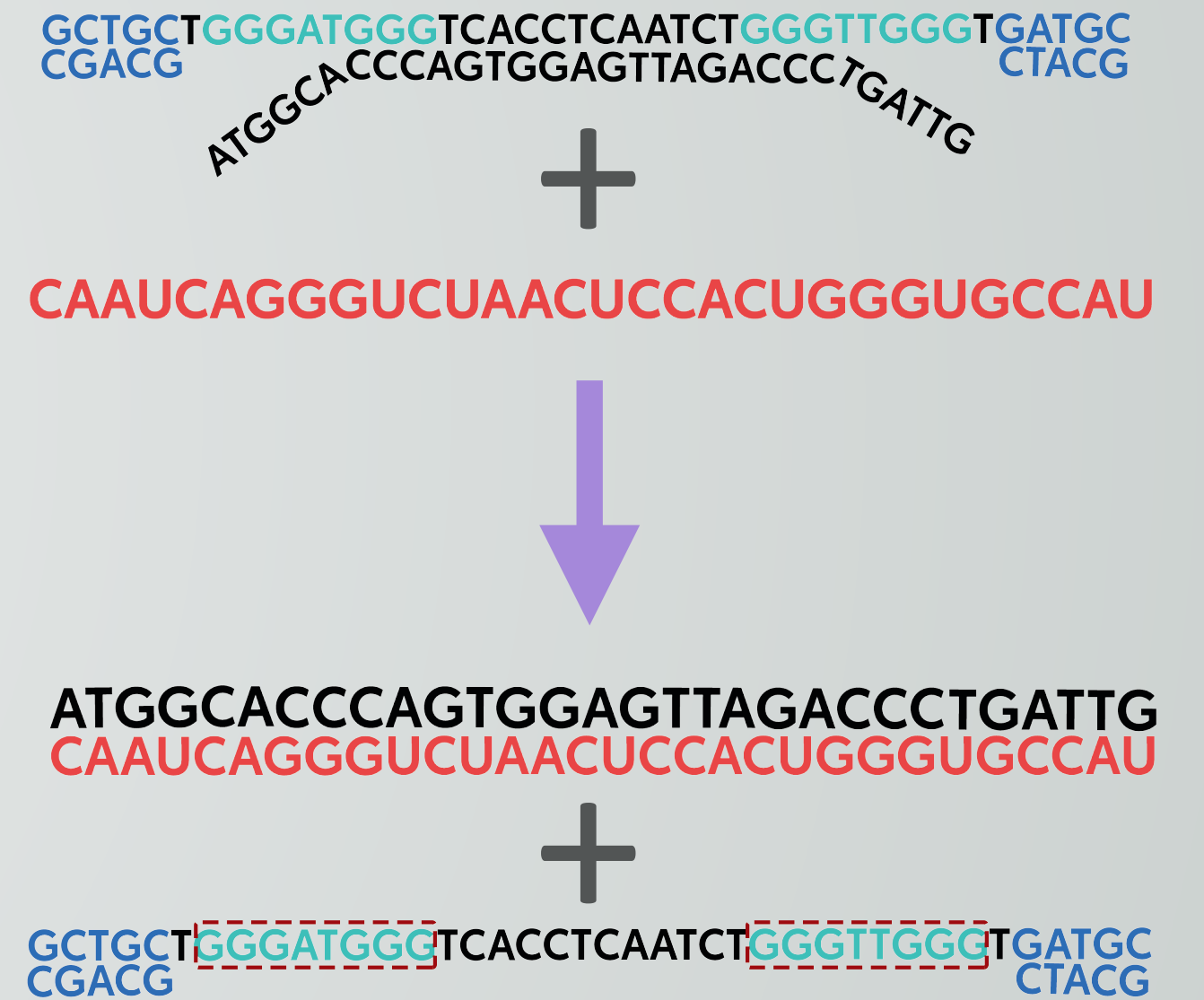
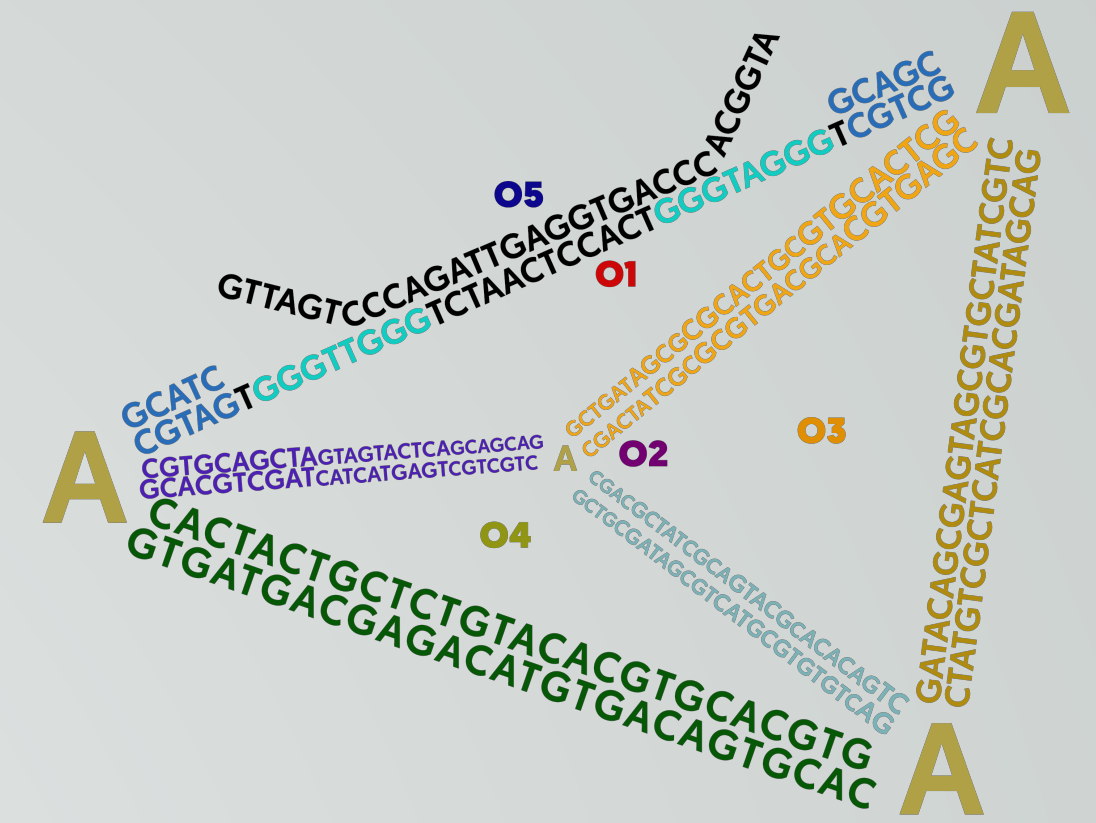


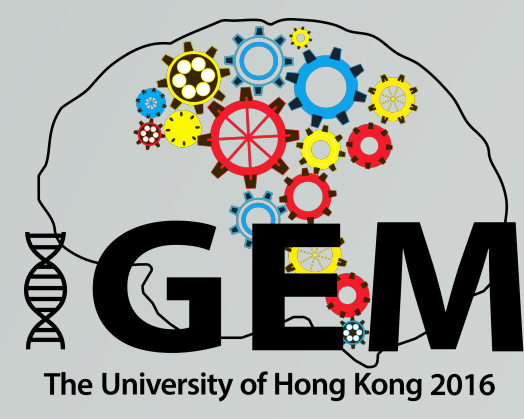
Results





Results





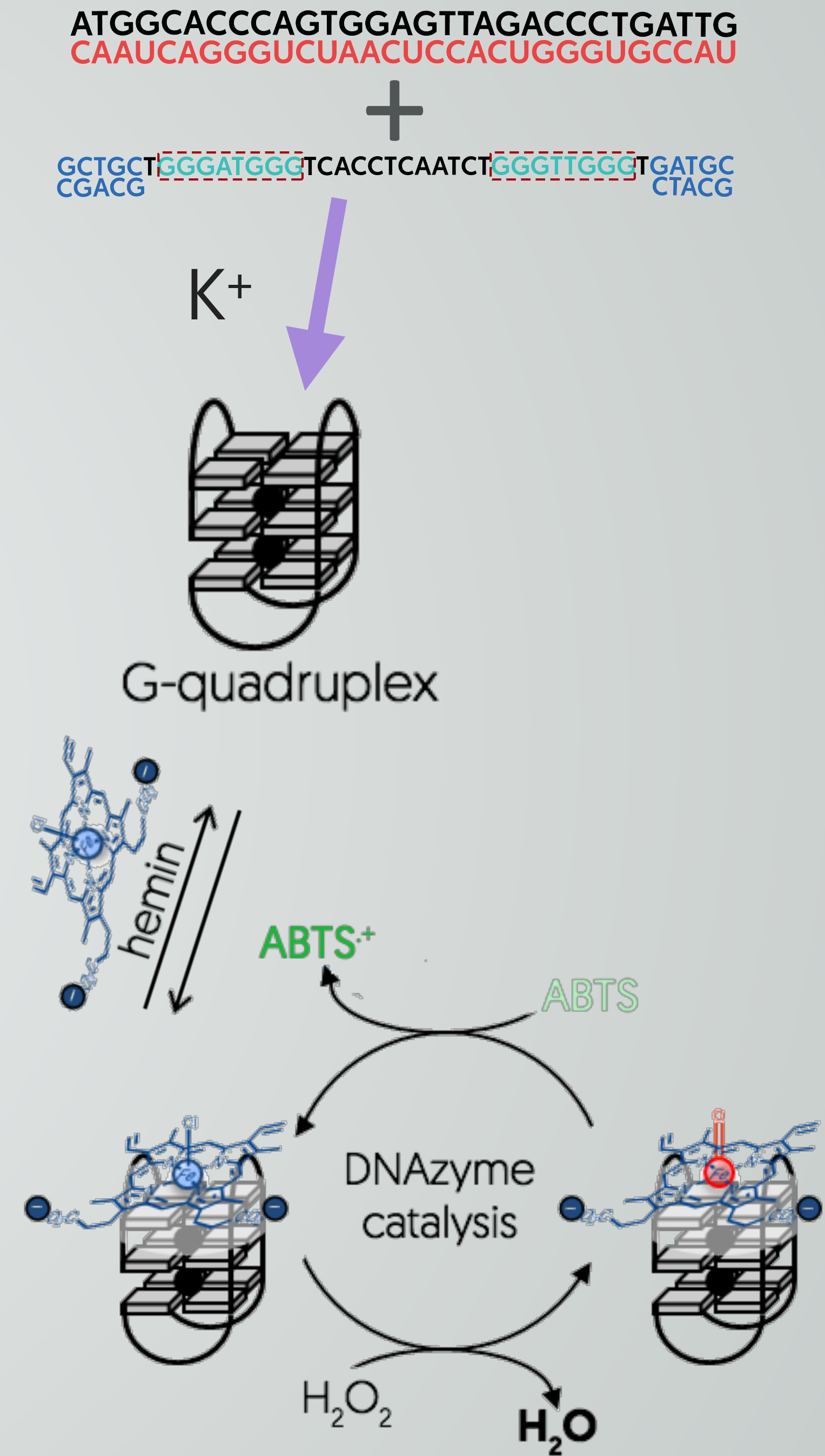
Results



Tetrahedron	+	+	+
Input	+		
Random input		+	

Results

Tetrahedron	+	+	+
Input	+		
Random input		+	

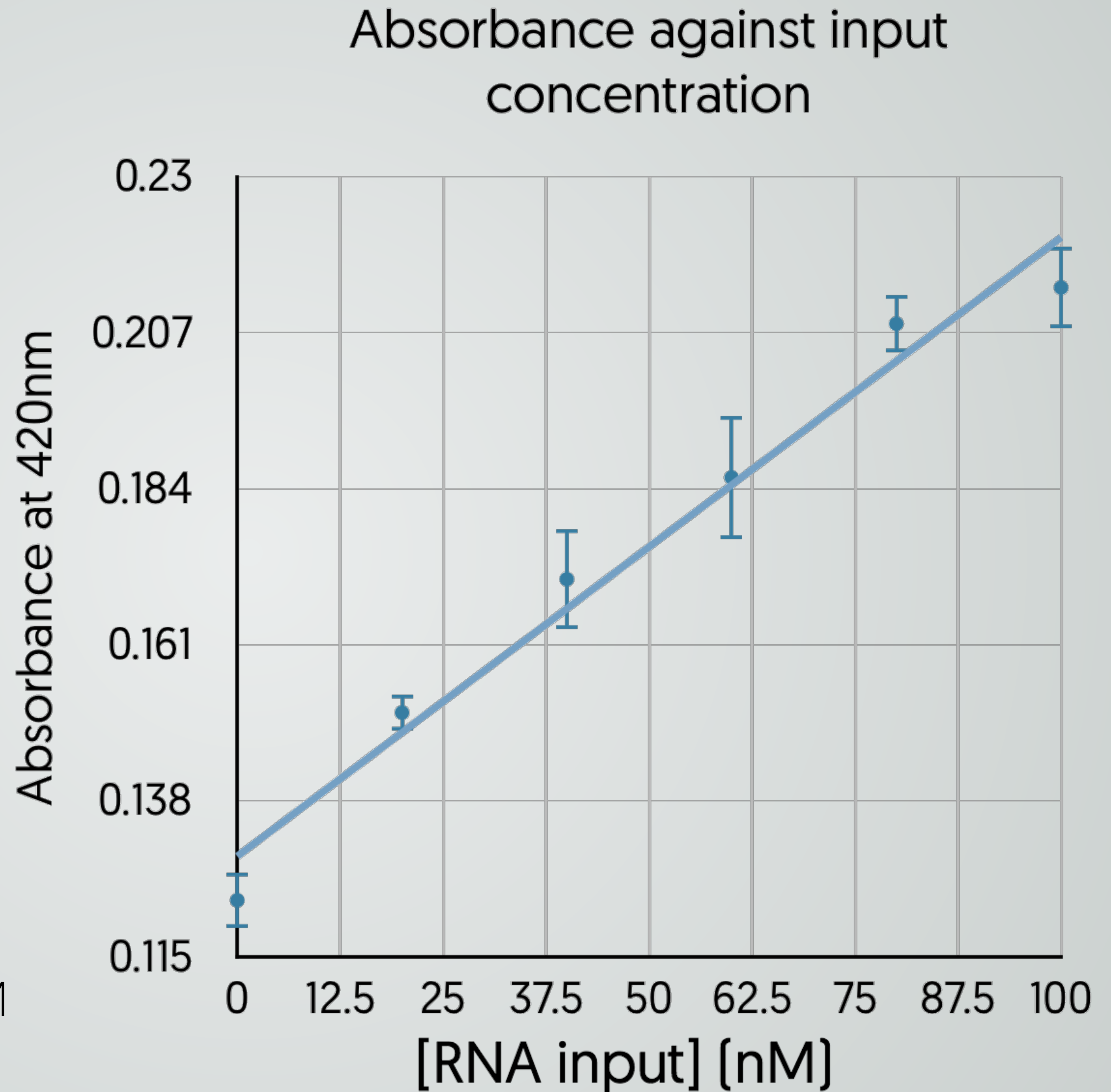


Results

$$y=0.0009x+0.1298[R^2=0.9739]$$


LOD=17.2nM

Typical serum conc. = 72-720nM
[0.5-5ng/ μ l]



Absorbance against input
concentration

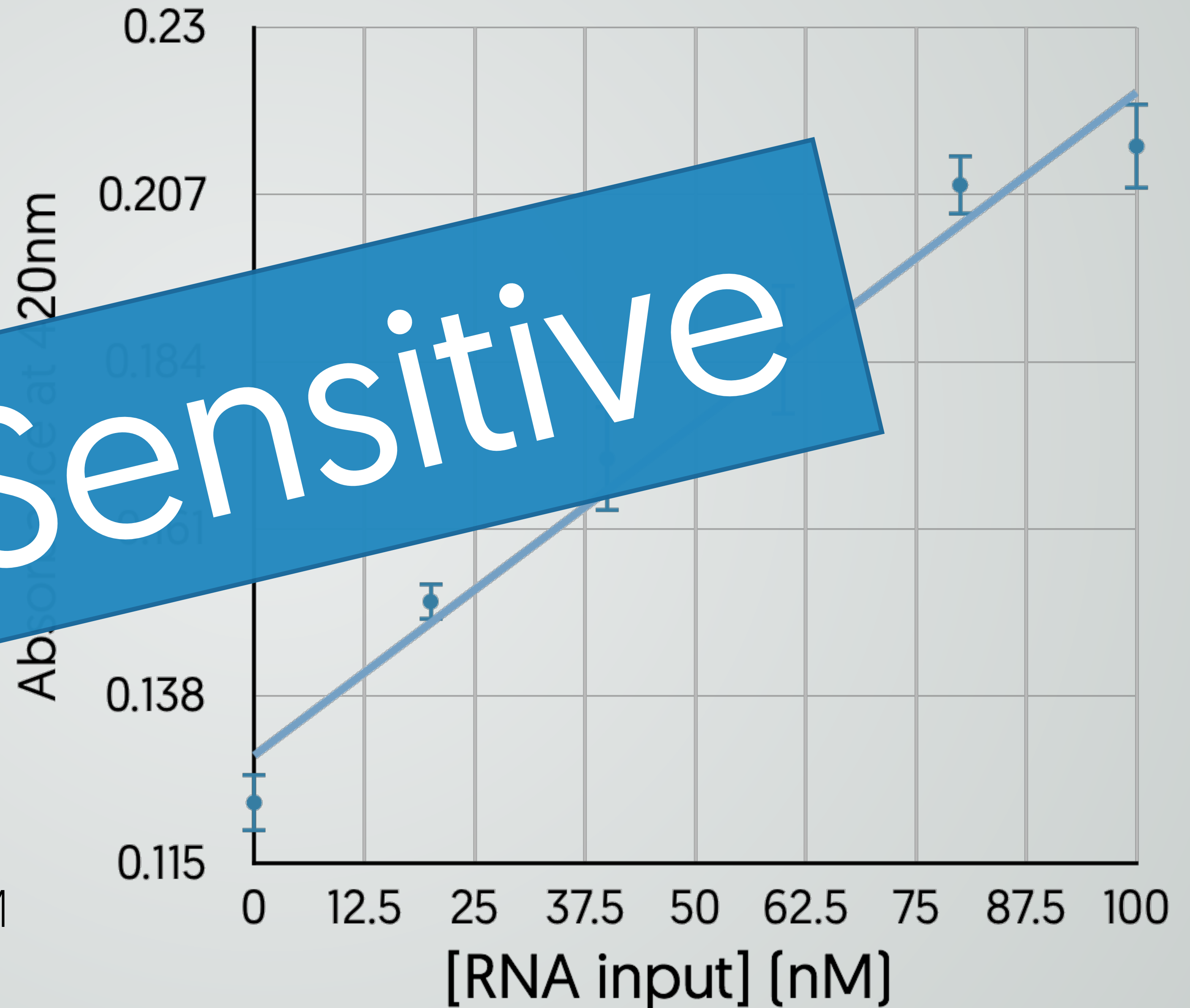
Results

 **Sensitive**

$$y=0.0009x+0.1298[R^2=0.9739]$$

LOD=17.2nM

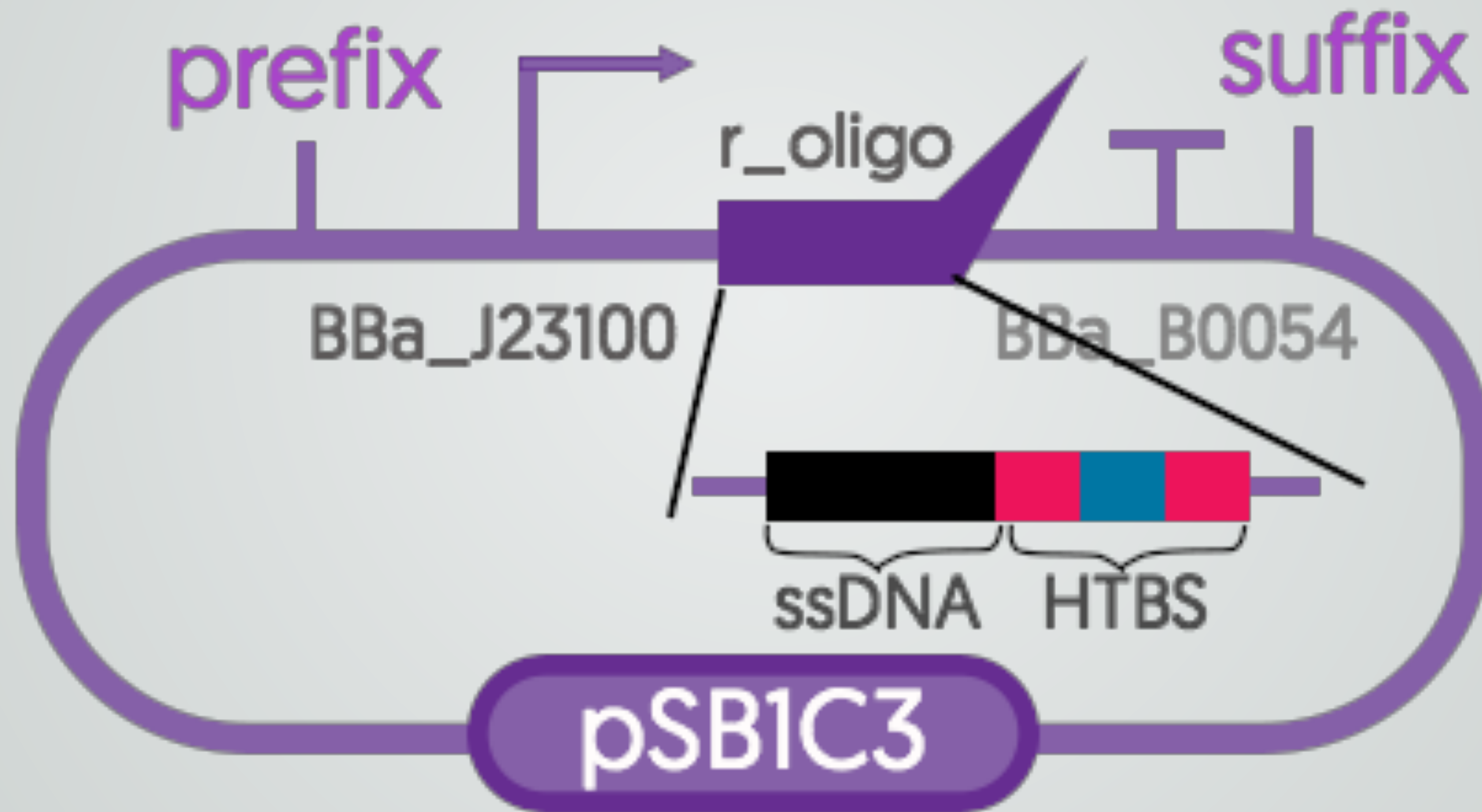
Typical serum conc. = 72-720nM
[0.5-5ng/ μ l]



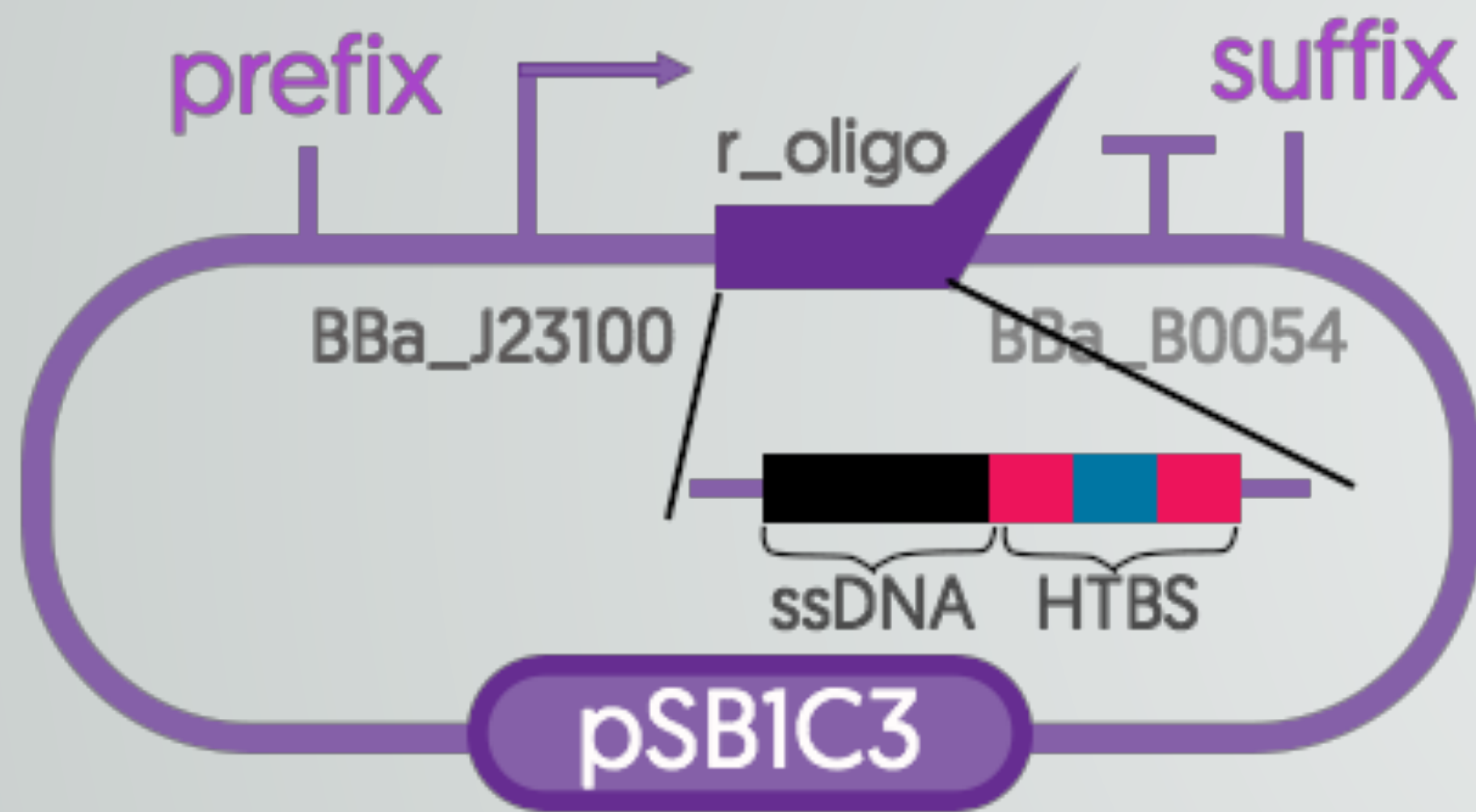


Device

Device



Device





Future Work



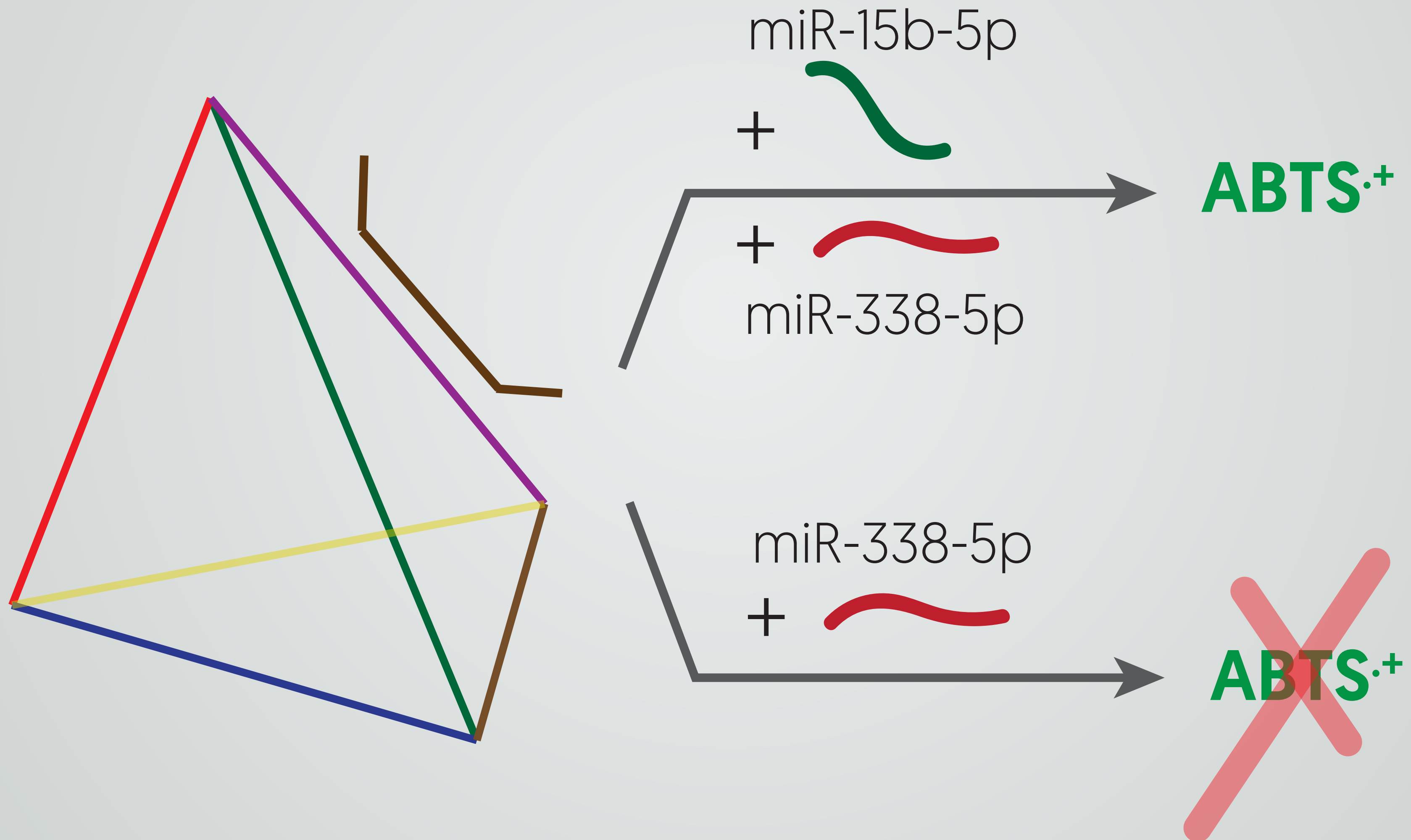
Future Work

TEM



Future Work

Future Work





Future Work

Future Work



Easily immobilized
on surface

Future Work



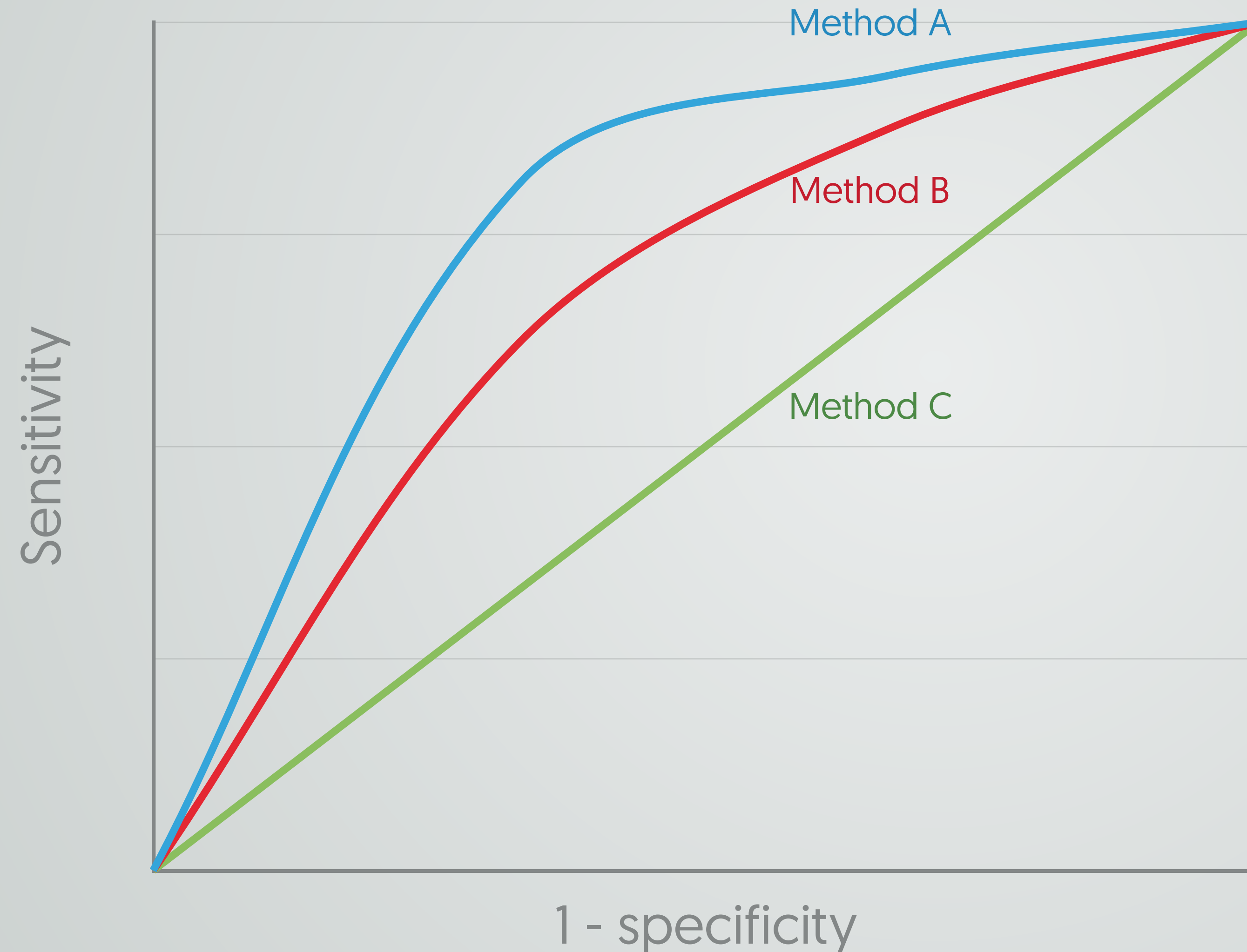
Easily immobilized
on surface

Paper diagnostics



Future Work

Future Work



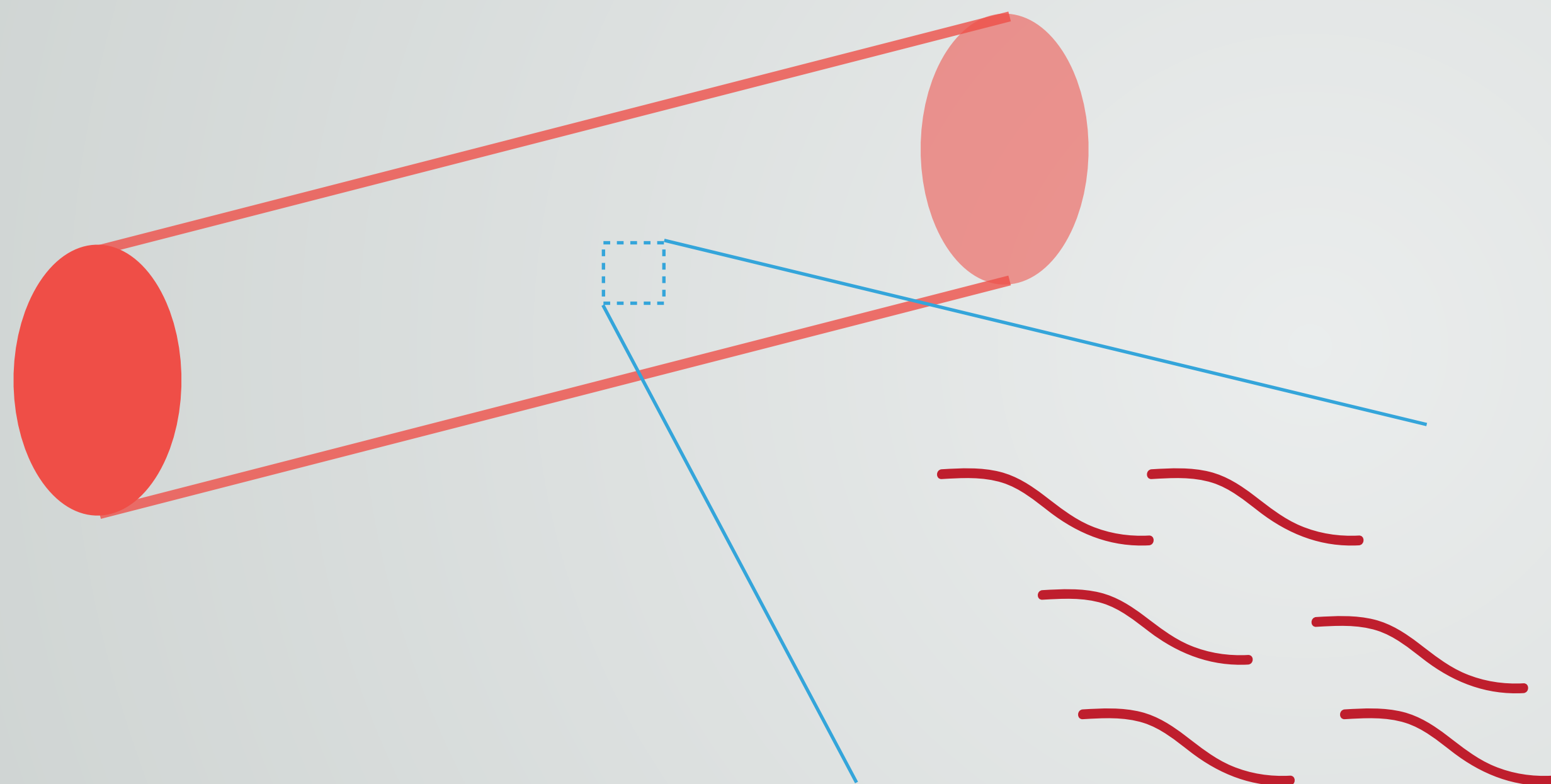
Method A



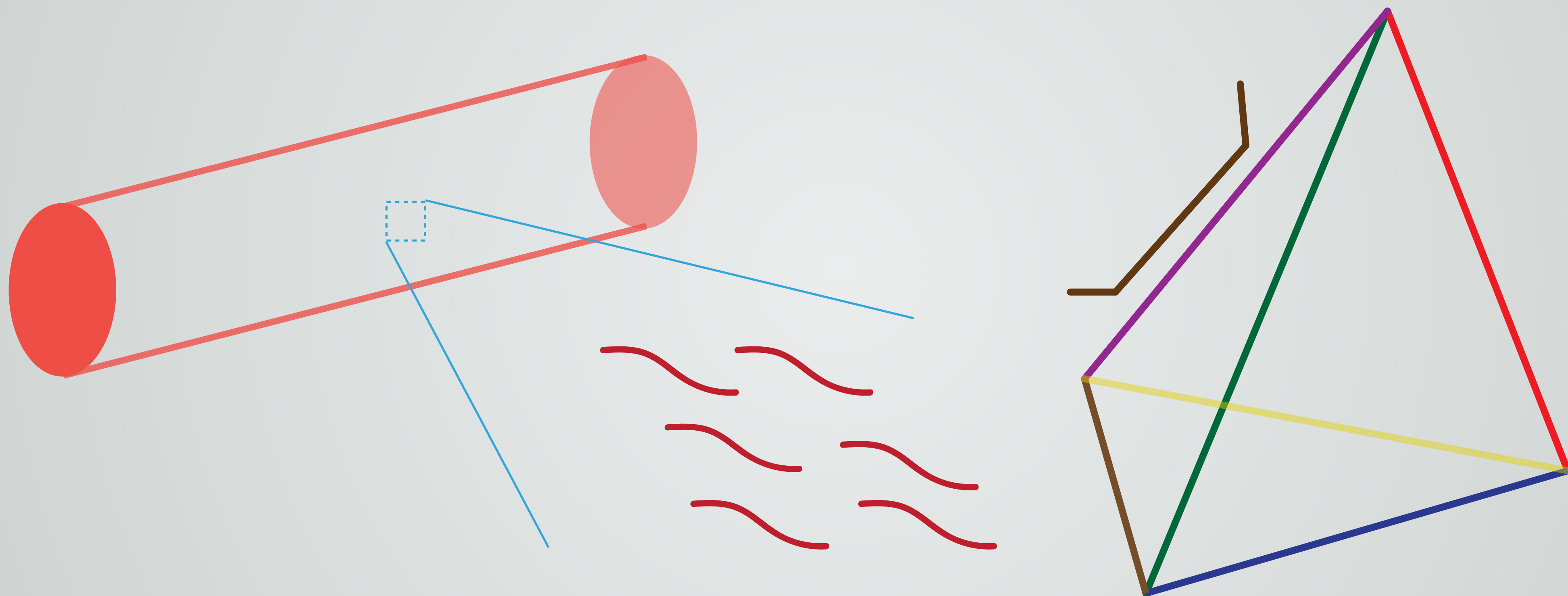


Future Work

Future Work

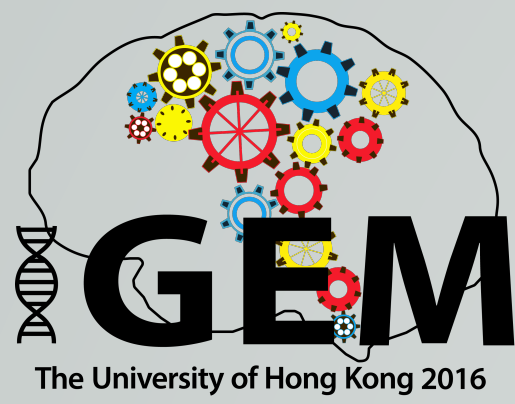


Future Work





Future Work



Future Work

Lower error of per-base synthesis



Human Practices



Human Practices

Synbio with humanities



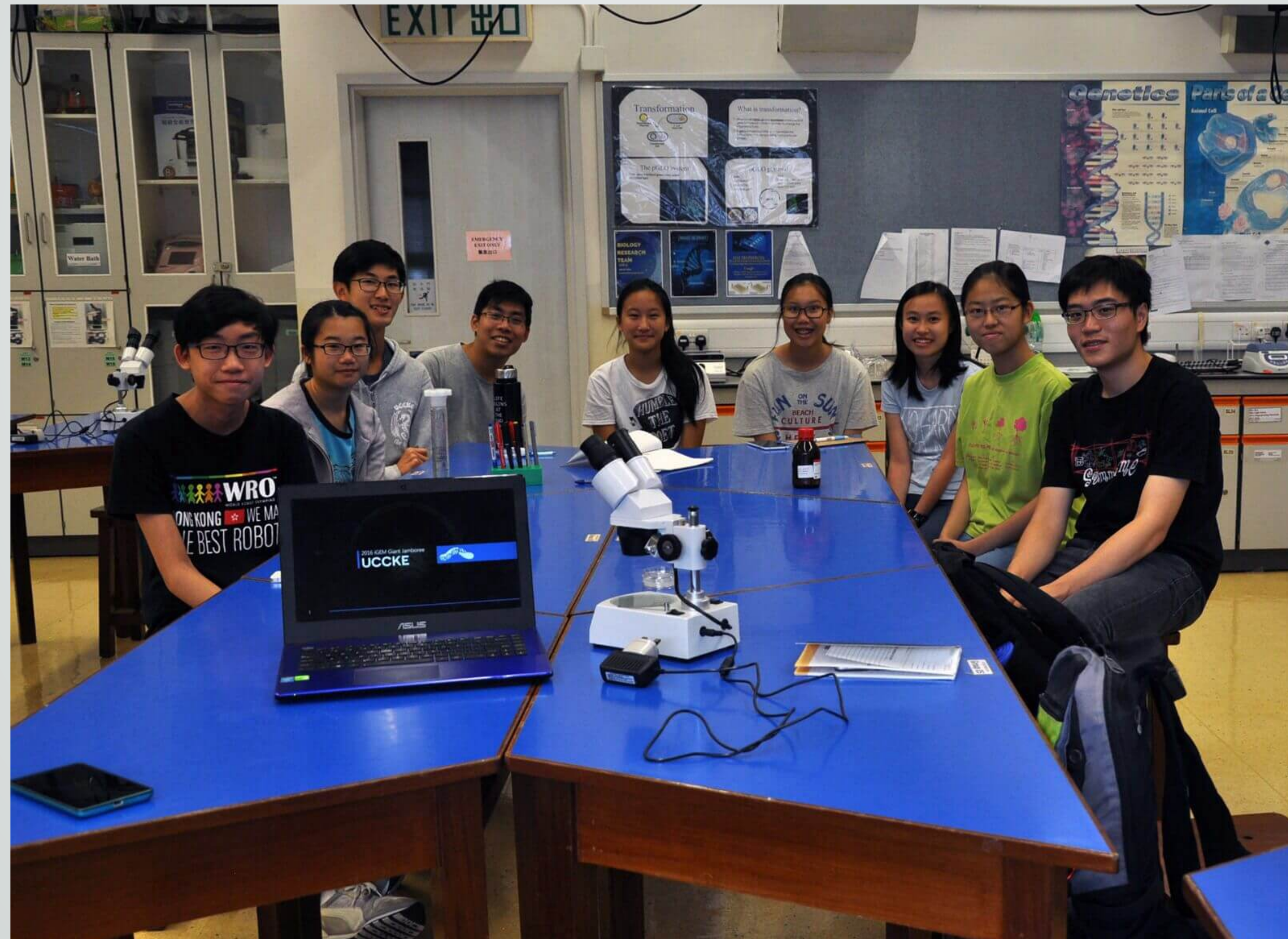
Human Practices

Synbio with humanities



Human Practices

Human Practices



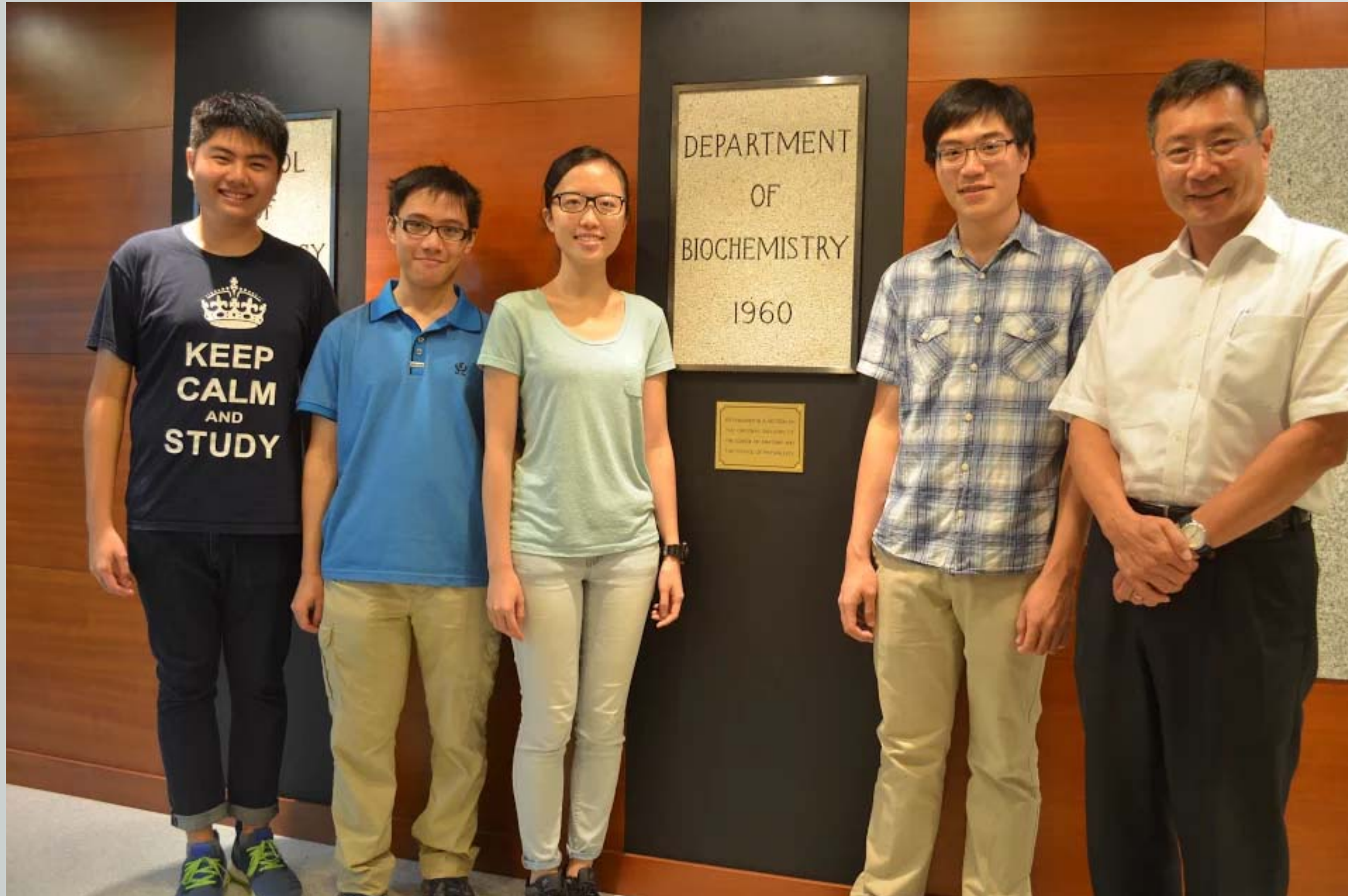


Human Practices

Human Practices



Human Practices



Professor Danny Chan

SY and HY Cheng Professor in Stem Cell Biology
and Regenerative Medicine;

Assistant Dean (Research Postgraduate Studies), LKS
Faculty of Medicine;

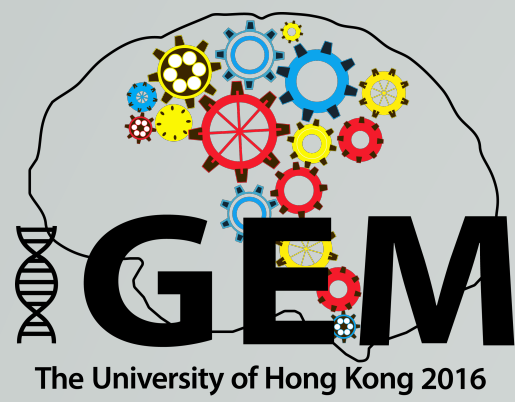


Human Practices

Risk Assessment



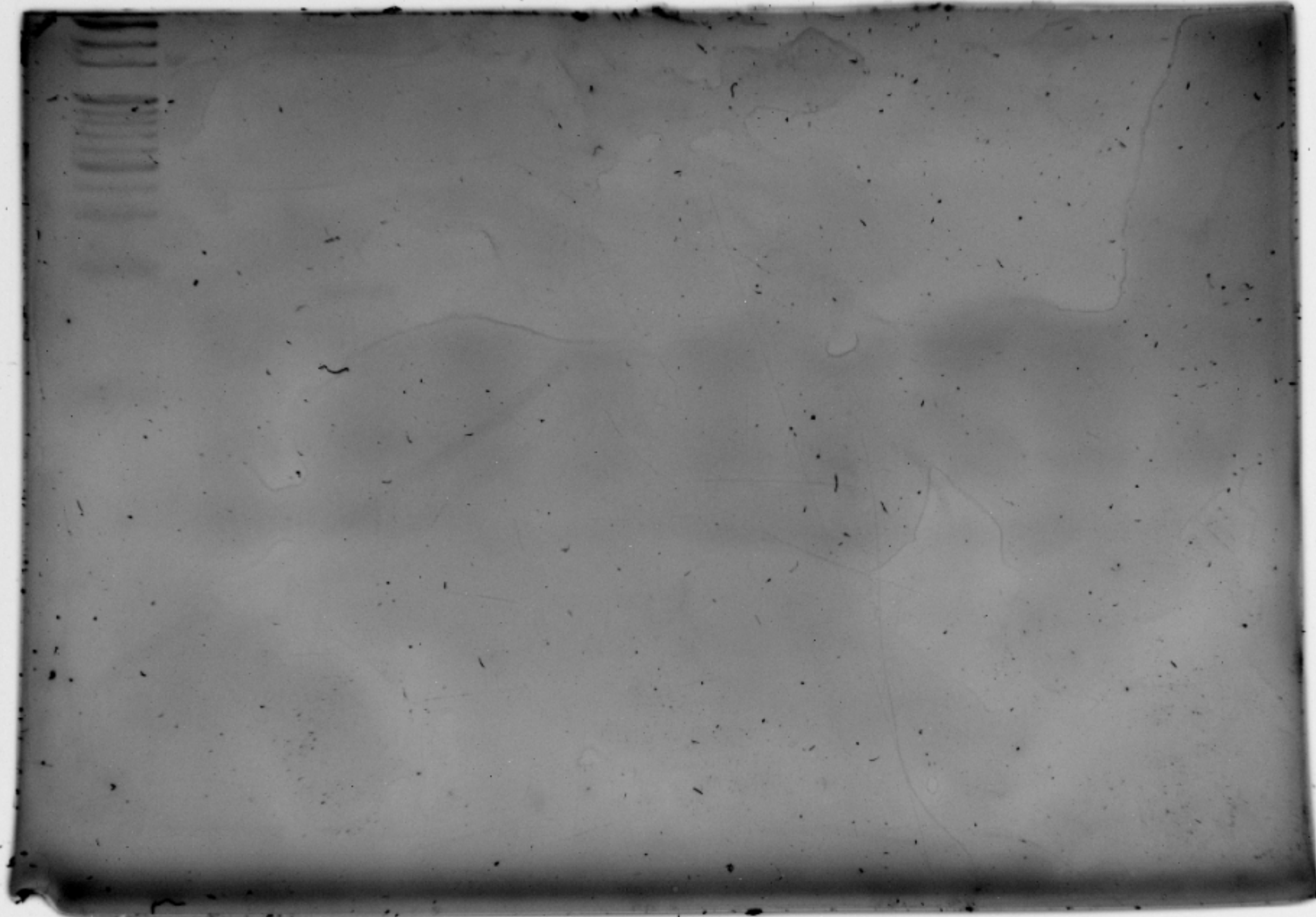
Our journey



Our journey

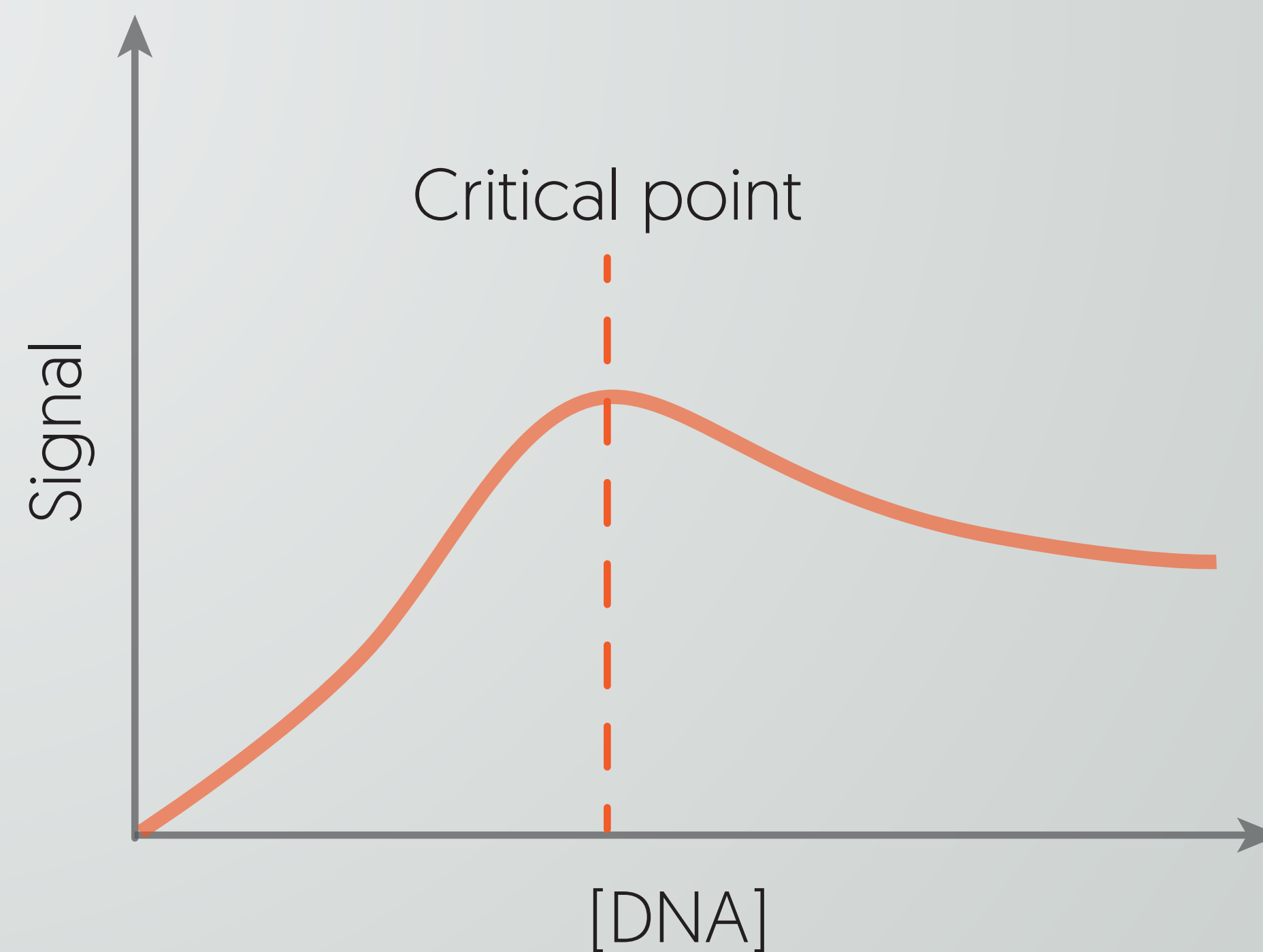
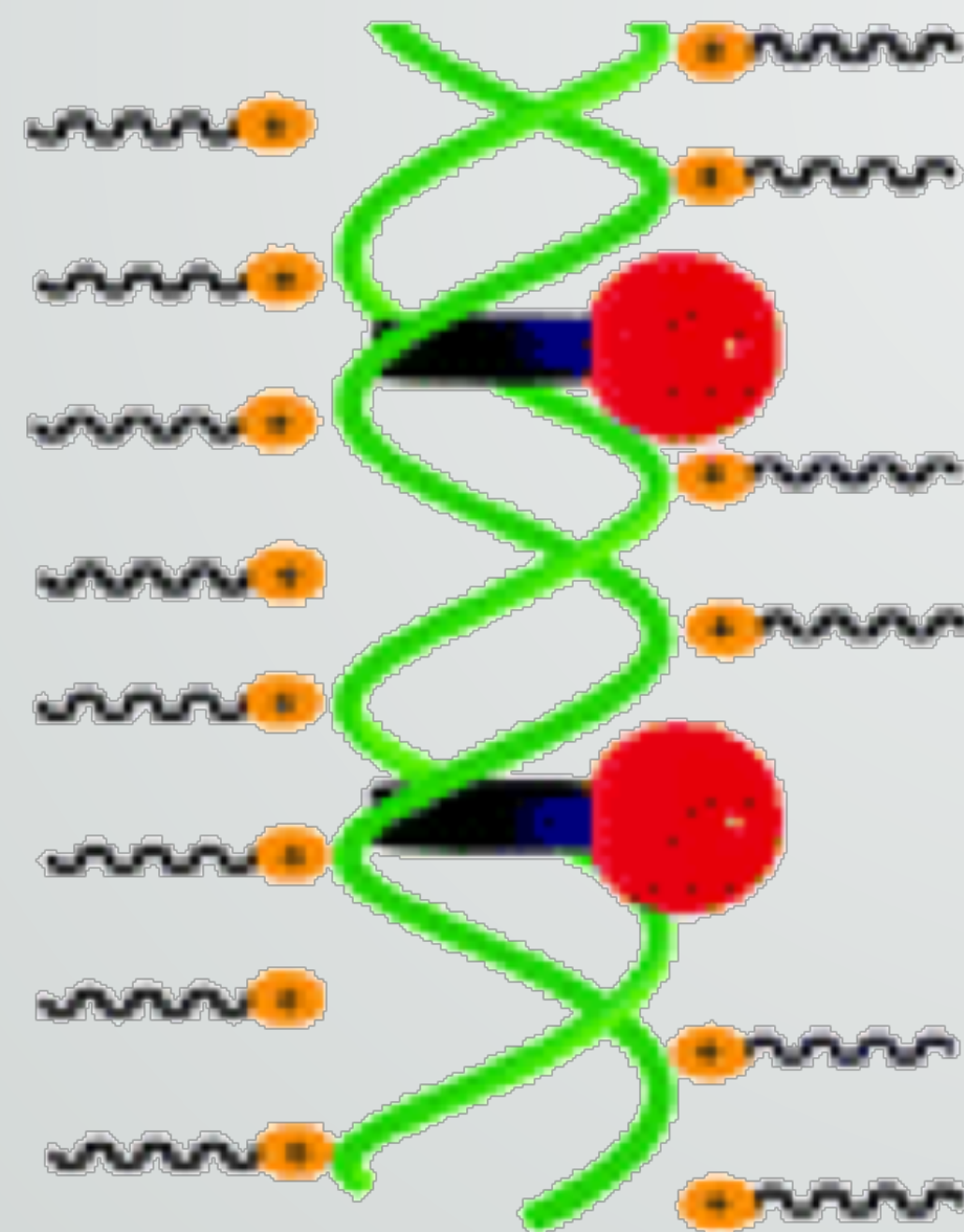
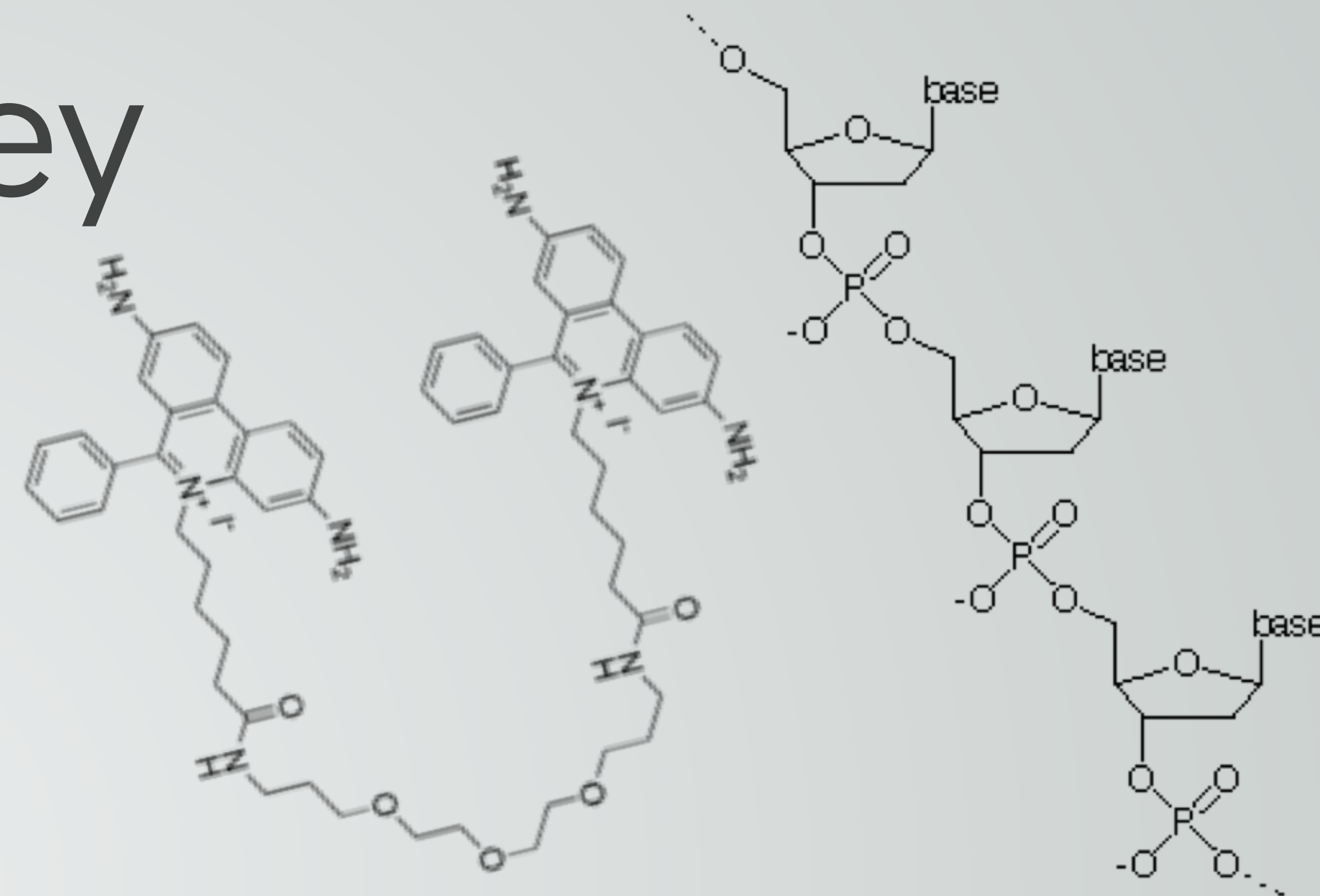
En route from 0 to 1.

Our journey



Loading:
150nM, 6uL
w/ NEB Loading Dye
Staining:
Gel Red, post-staining, 30 minutes

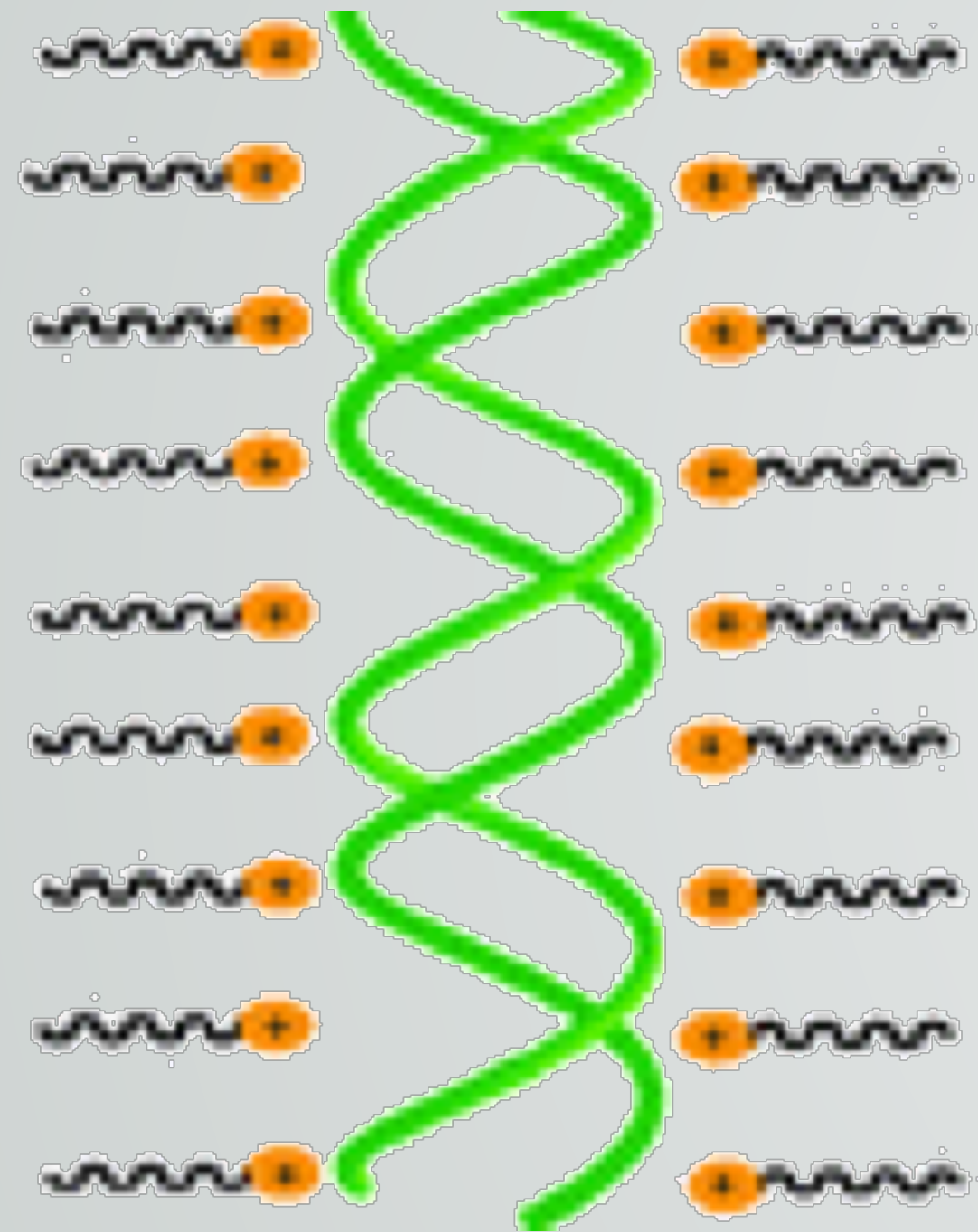
Our journey



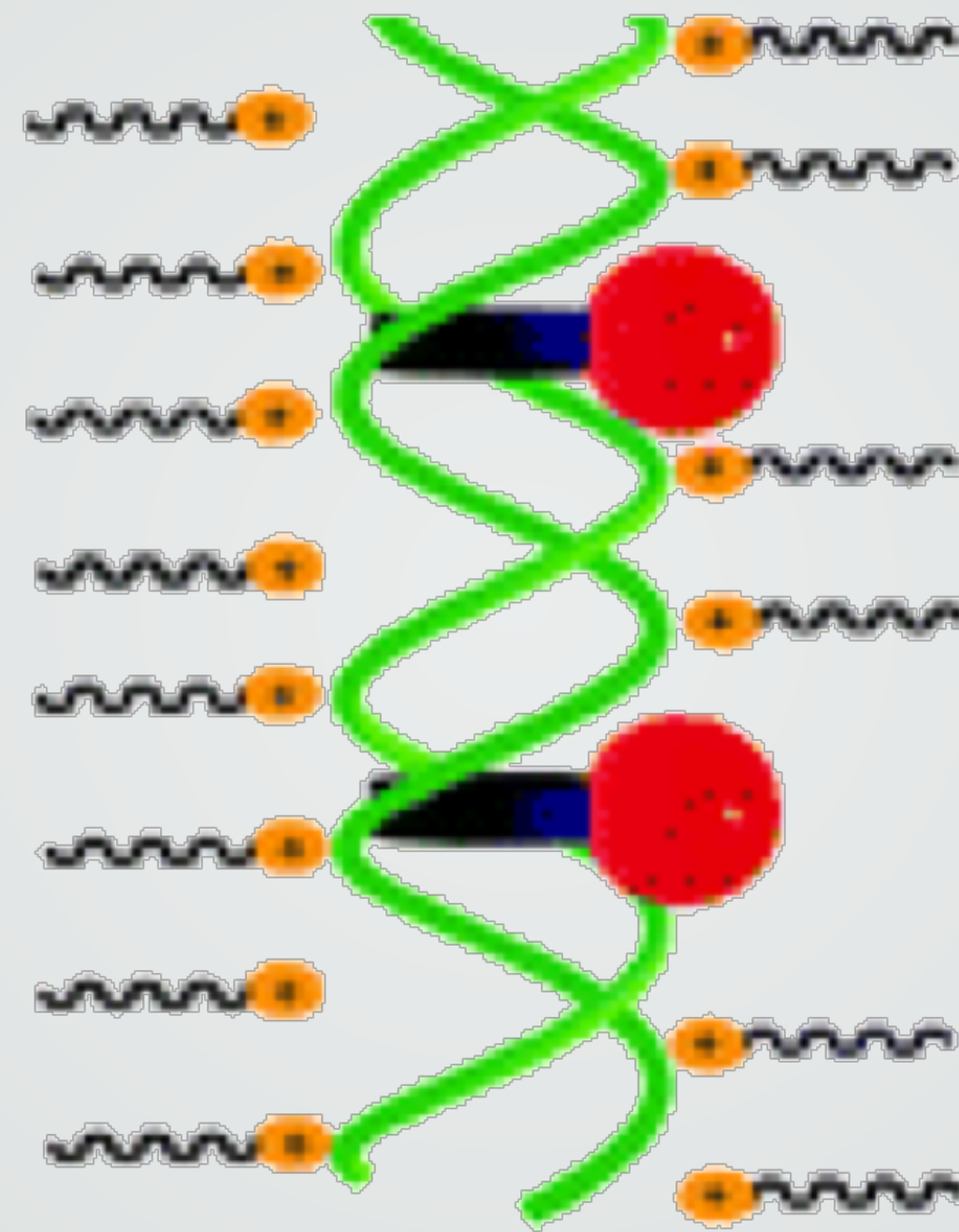


Our journey

Our journey



MORE

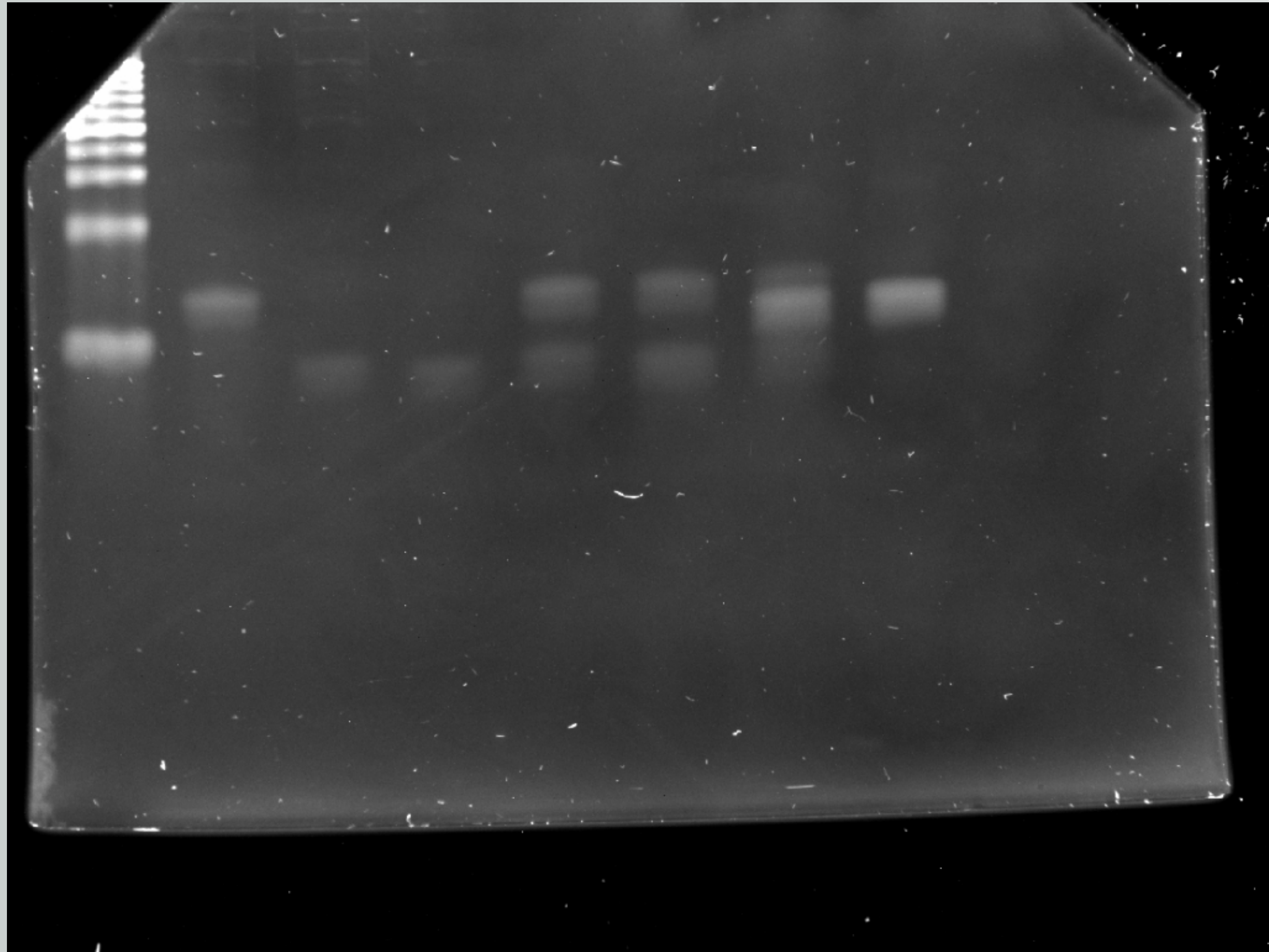


MORE



MORE

Our journey



Loading:
1uM, 6uL
w/ NEB Loading Dye
Staining:
Gel Red, post-staining, 30 minutes

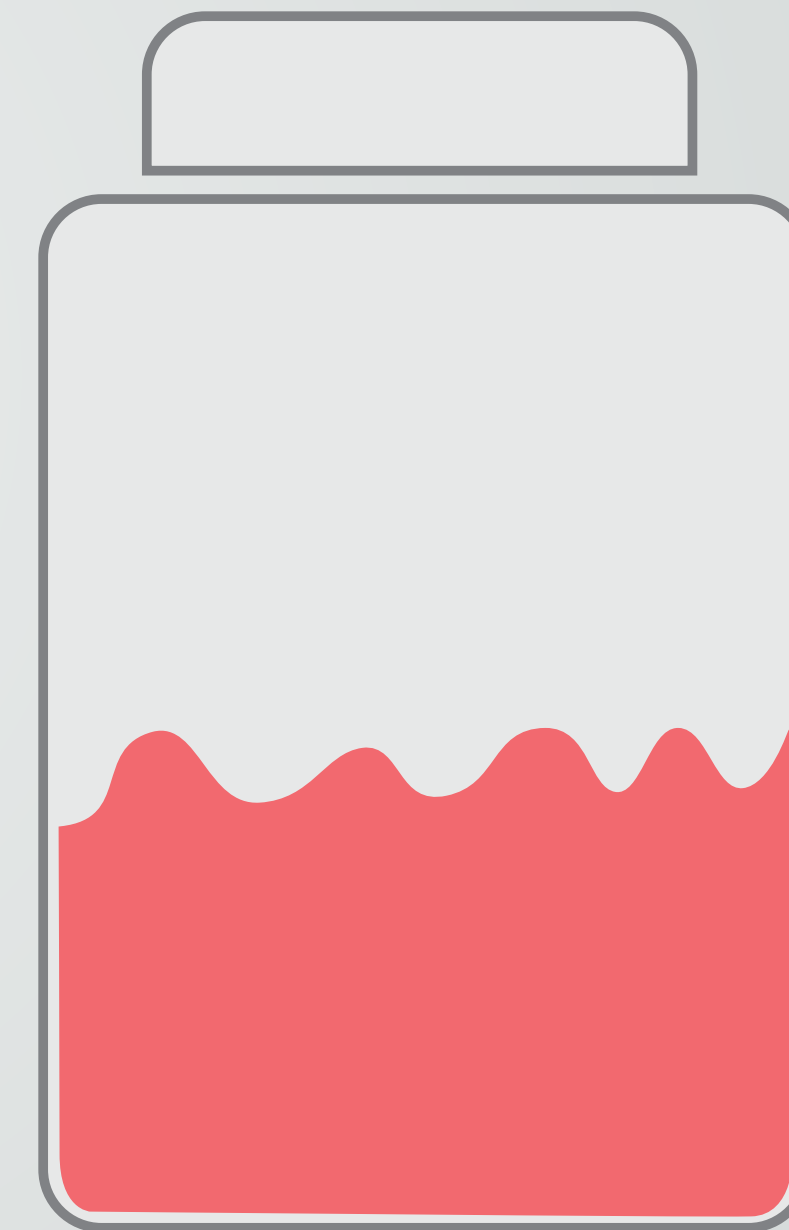


Our journey

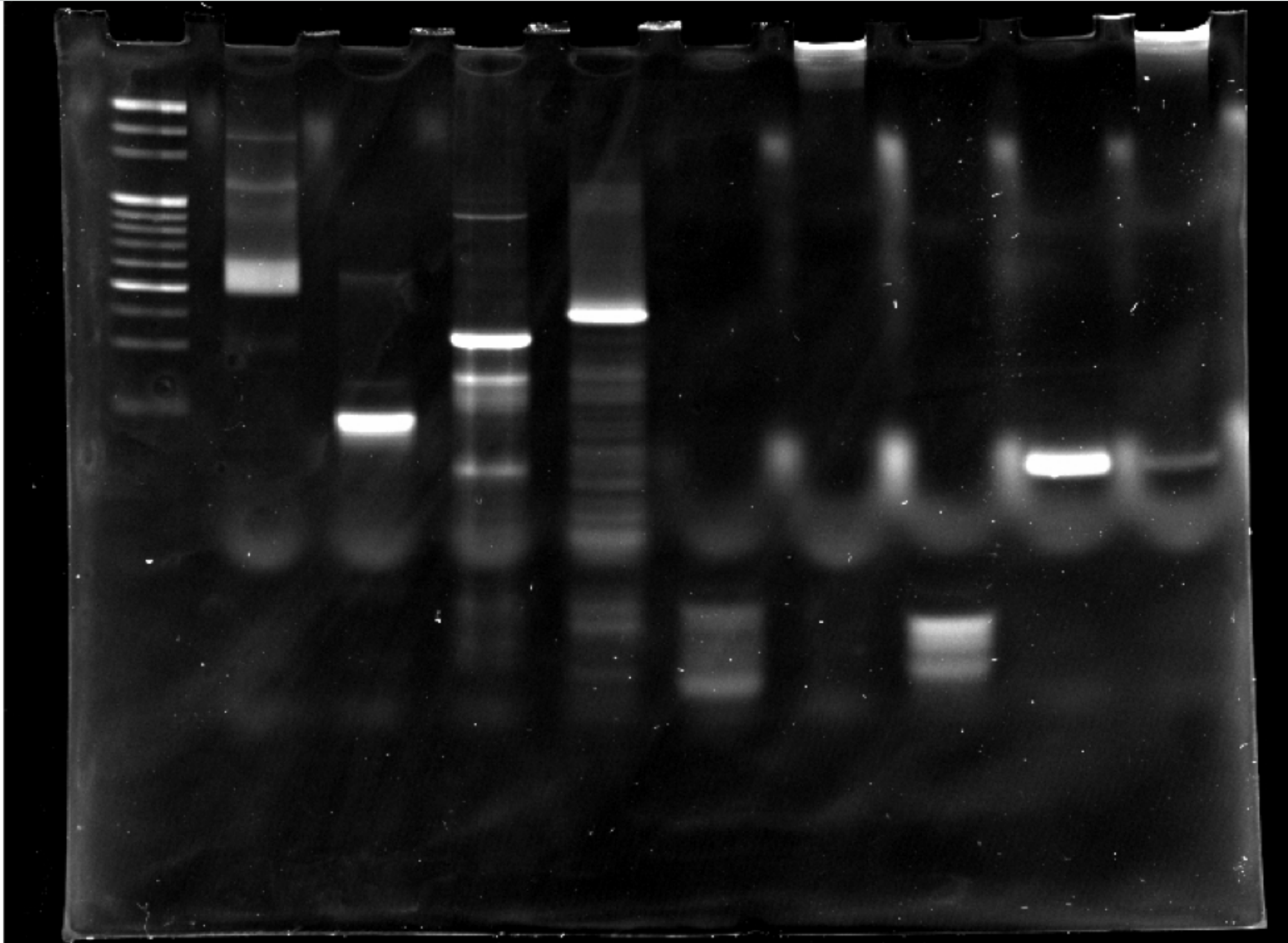
Concerns

Our journey

Concerns

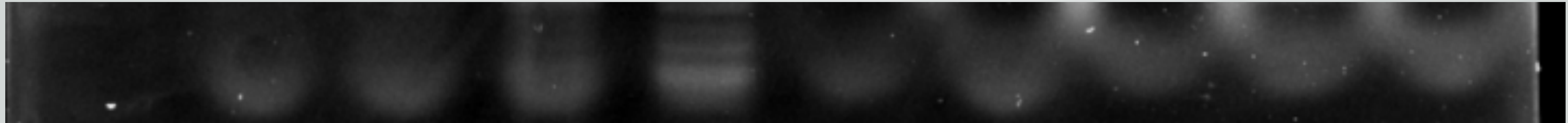


Our journey



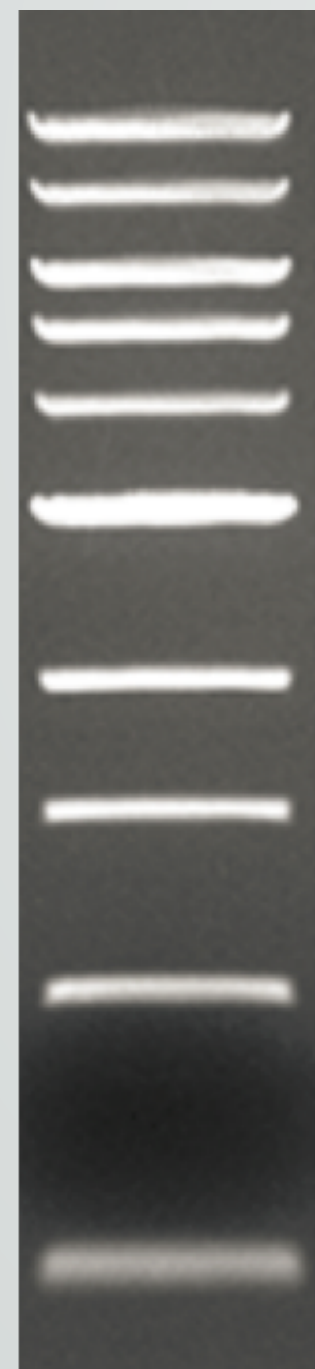
Loading:
1uM, 6uL
w/ NEB Loading Dye
Staining:
Gel Red, pre-staining in loading mixtures

Our journey



Ladder

UV Shadows

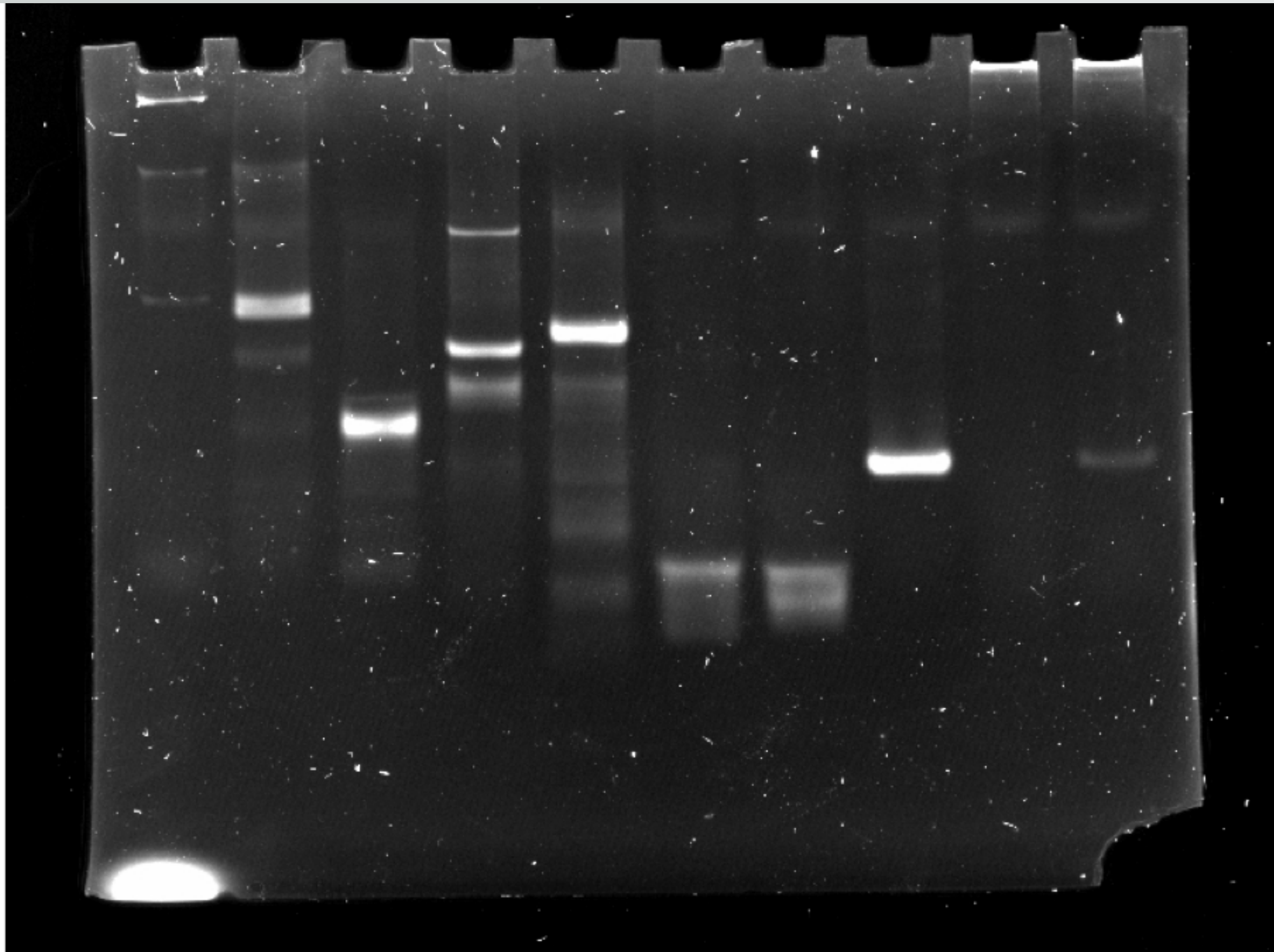


UV
shadow

Other substances

Bromophenol blue
Cyanol

Our journey



Loading:
1uM, 6uL
w/ self-made Loading Dye
[Glycerol + Gel Red]
Staining:
Gel Red pre-stained in loading dye



The University of Hong Kong 2016



Special thanks:



香港大學
THE UNIVERSITY OF HONG KONG

Dr. Julian A. Tanner



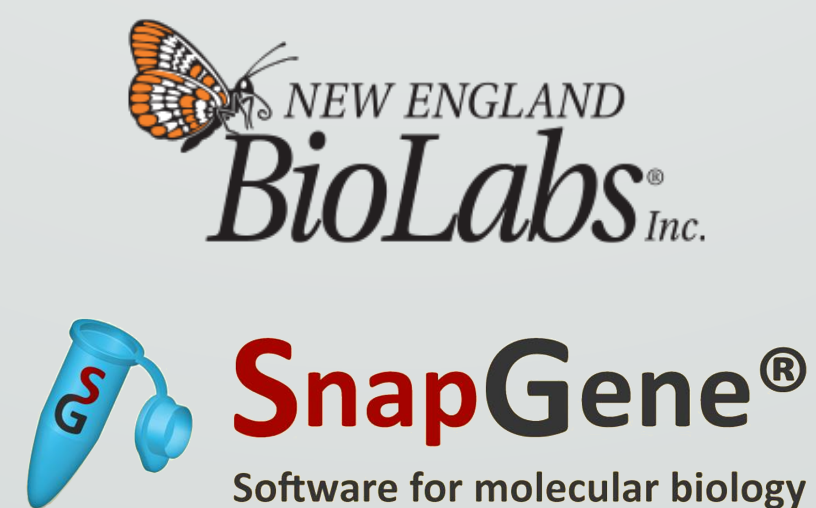
Mr. Simon Shiu
Mr. Jacky Yuen

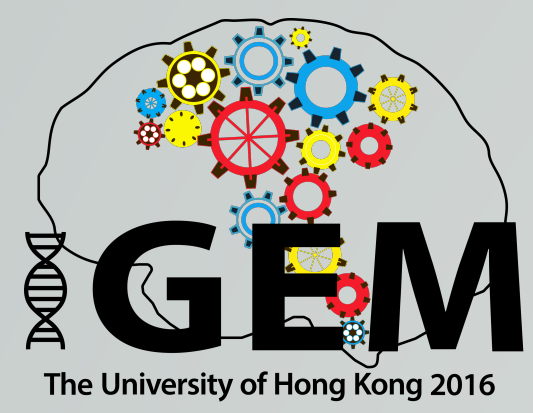
The Team:

Lai Hei Wai
Lau Yui Ching
Ho Sin Ning Shannon
Tam Ka Ki Tim
Lam Yung Shing
Yung Canaan
Law Janice Hiu Ching
Lo Yik Hei
Na Ri Sha
Dissanayake Thrimendra
Chiu Man Ying
Chan Tak Lok
Wu Gabriel Tze Chung
Tsang To
Chu Ku Yin Alex
Ng Ka Hei
Wan Emily Tin Yan
Kabigtung Jessica

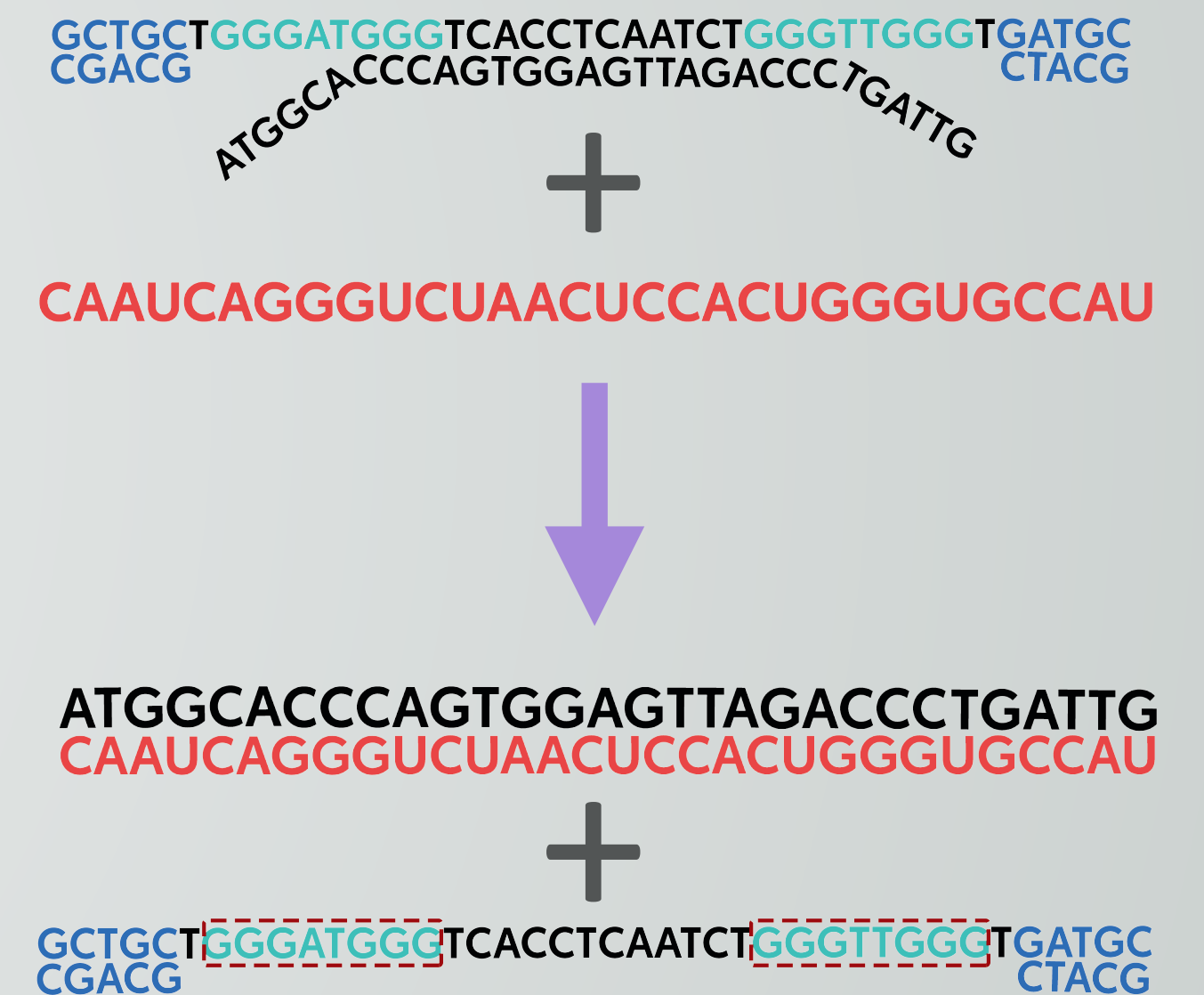
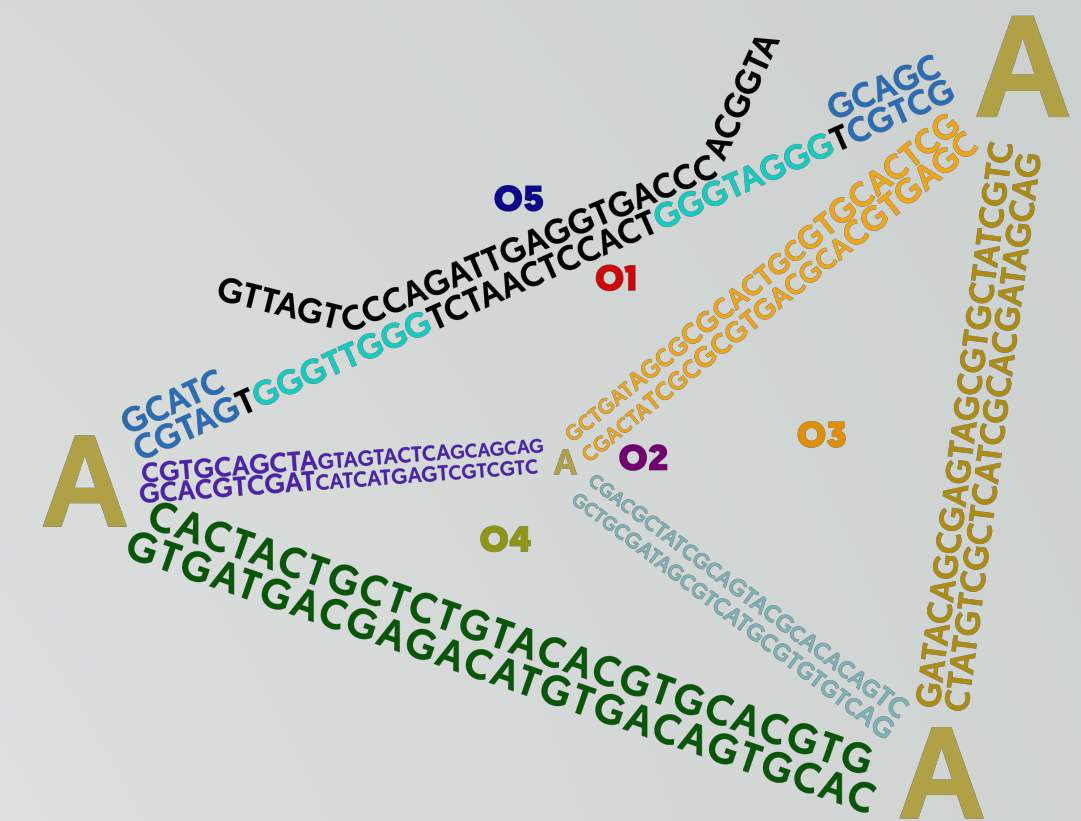
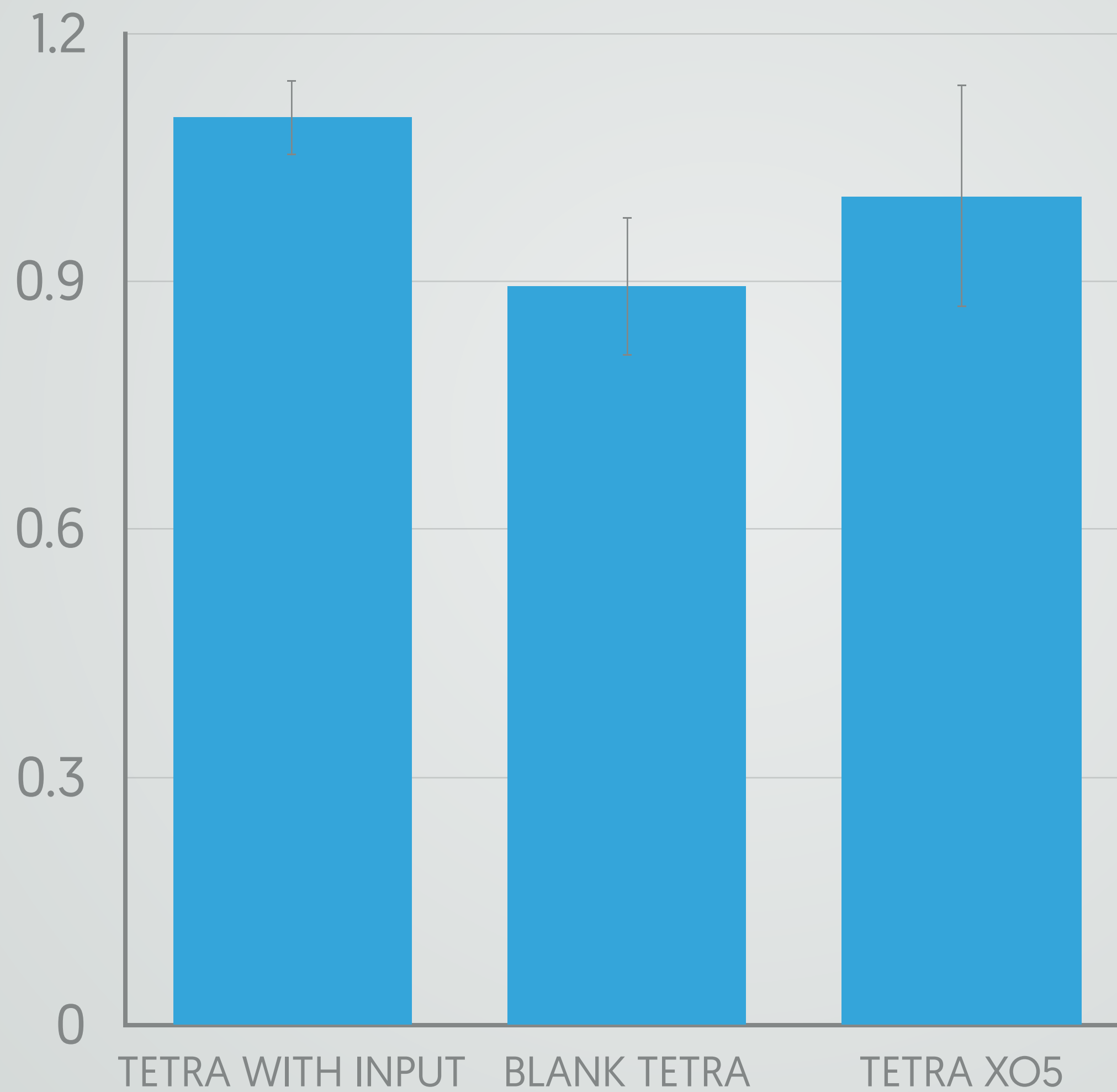
Student advisors:

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Lo Yat Kei Tommy
Pun Hok Sum Thomson

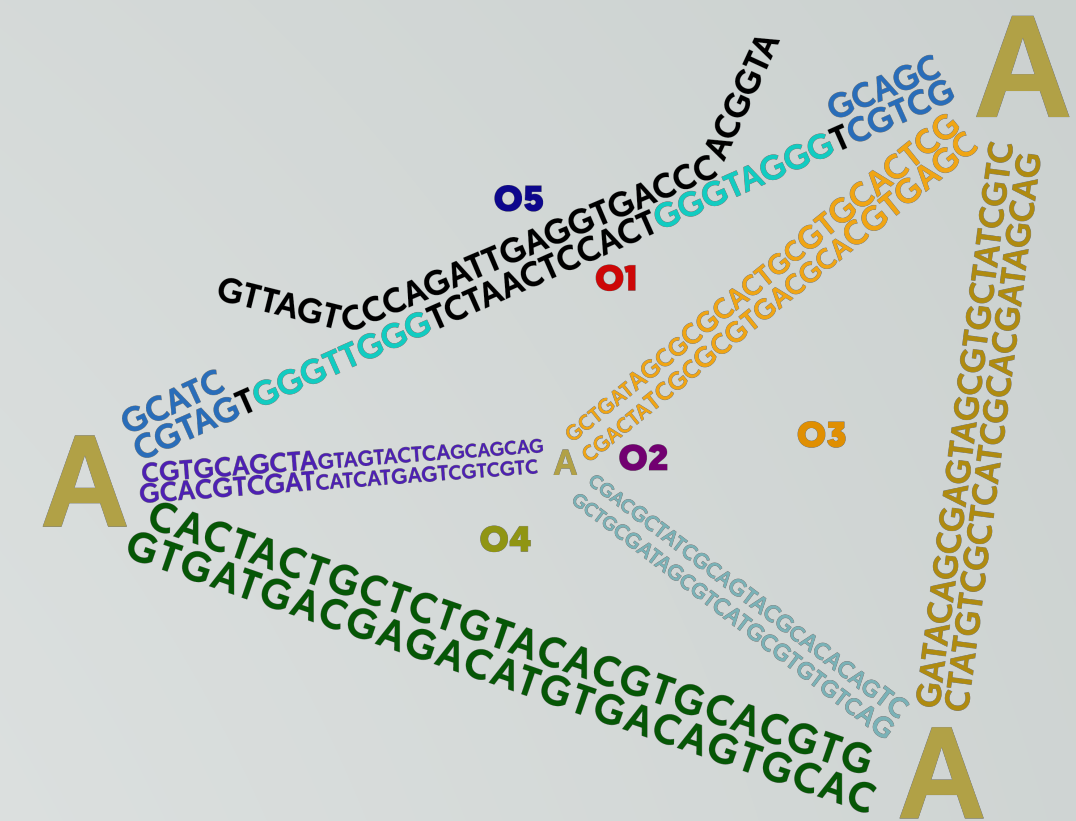
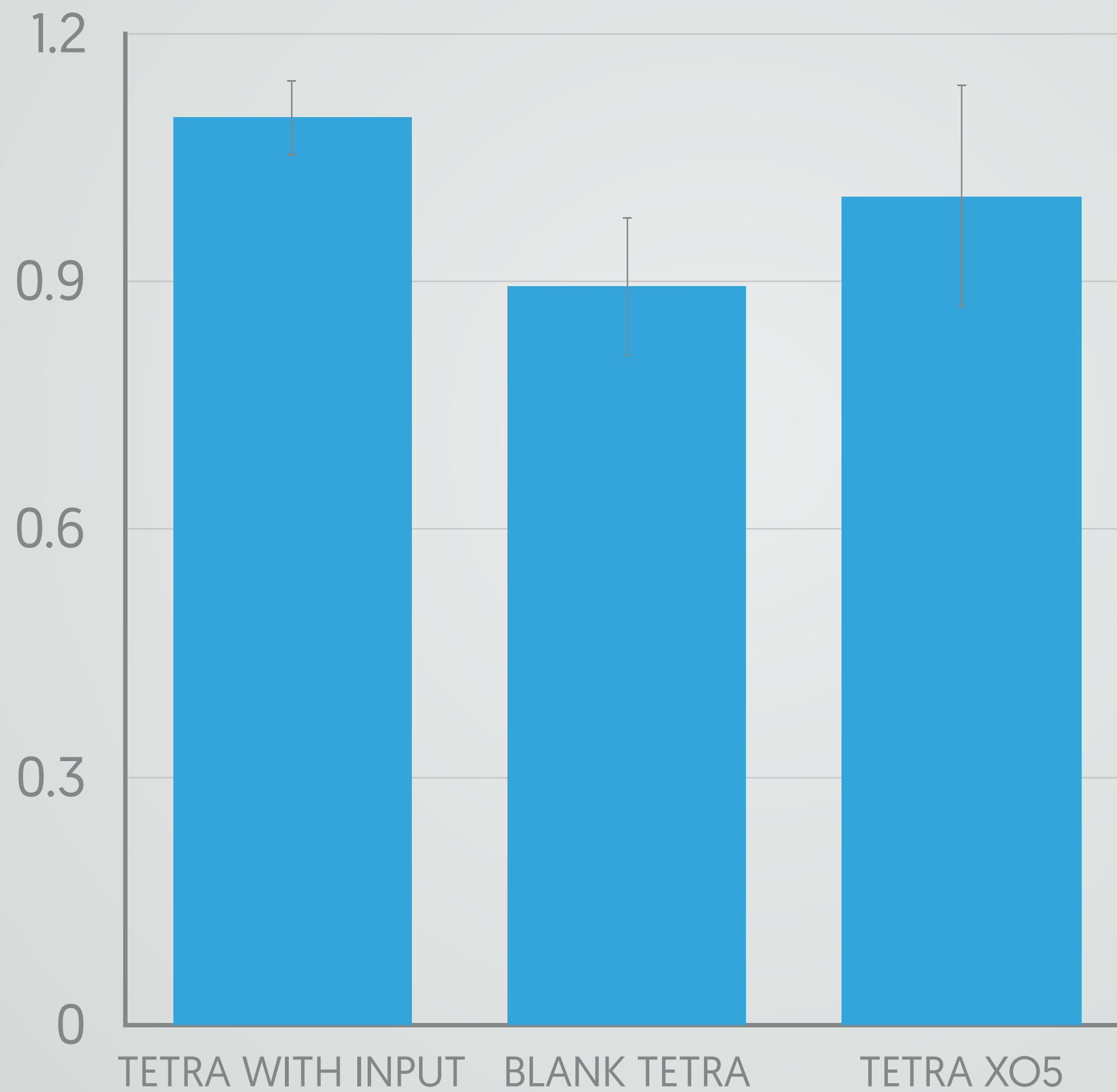




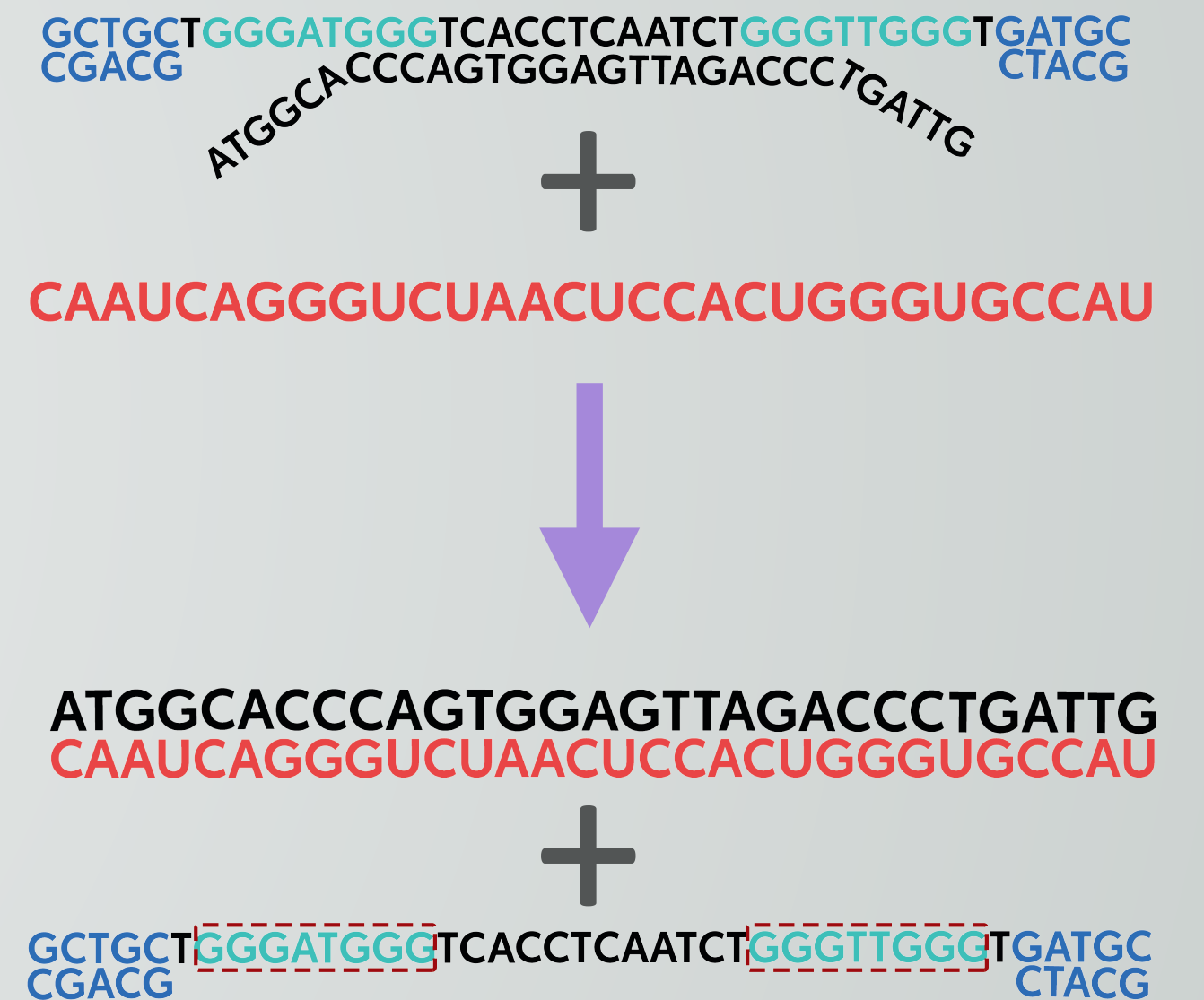
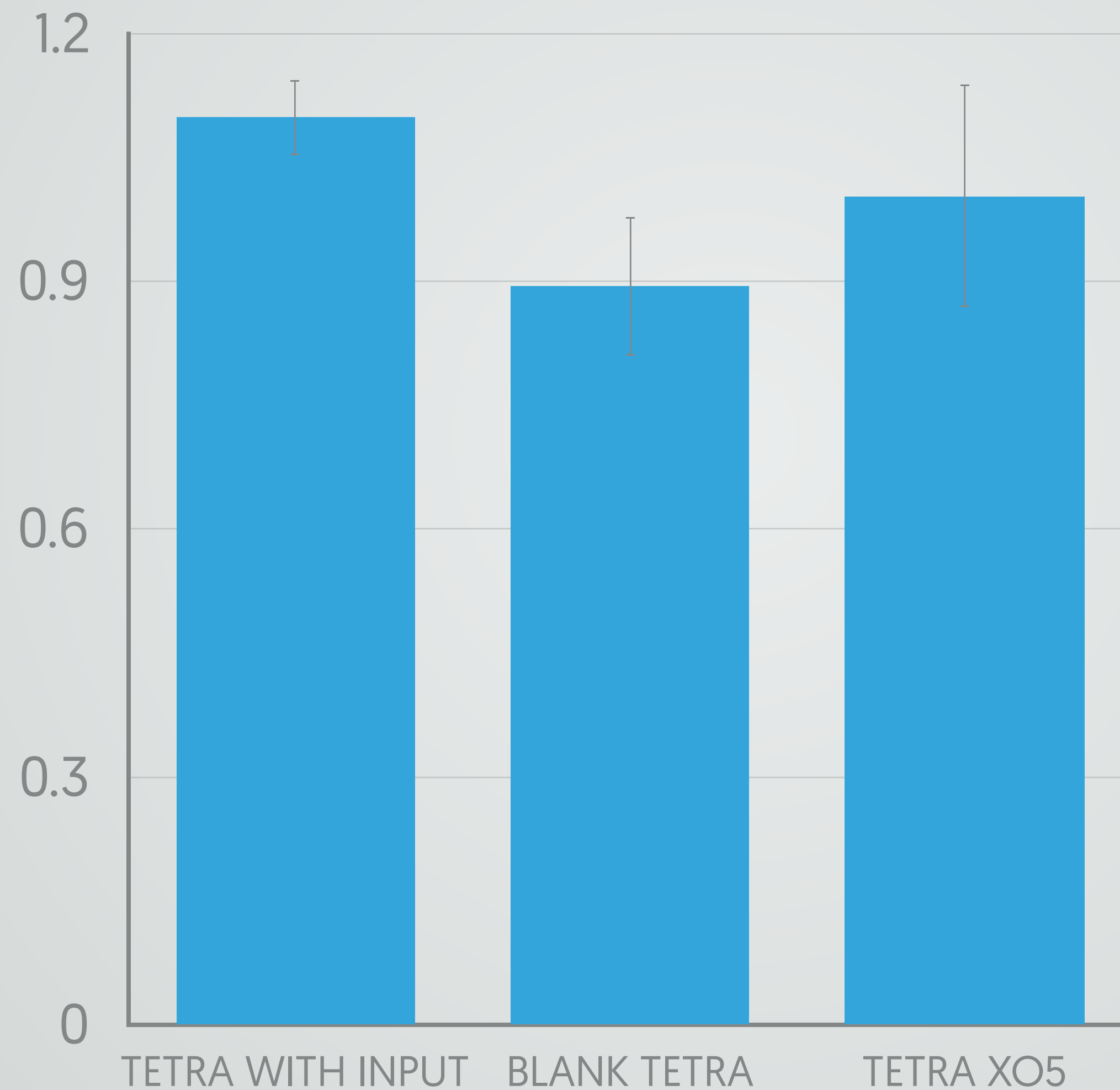
Results

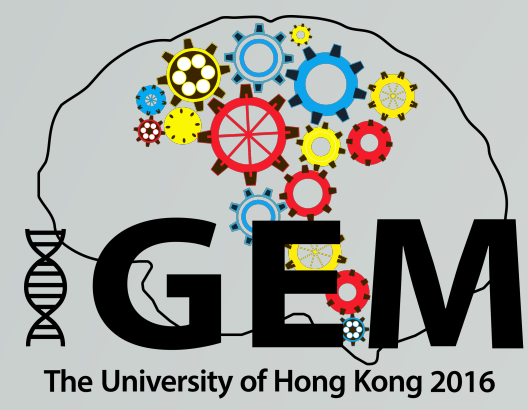


Results



Results





Results